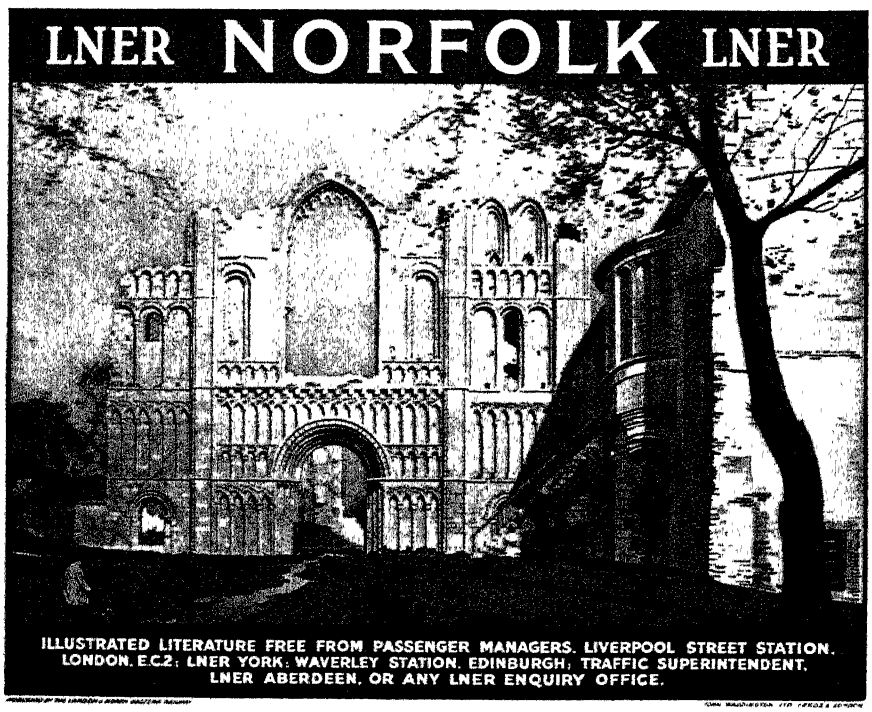
MODERN RAILWAY ADMINISTRATION

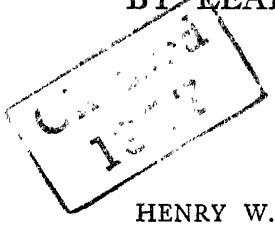


RAILWAY POSTERS—I

[Frontispiece, Vol. I

MODERN RAILWAY ADMINISTRATION

A PRACTICAL TREATISE BY LEADING RAILWAY EXPERTS



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VOLUME I

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PUBLISHERS' NOTE

One of the many effects of the Great War has been the rendering obsolete of pre-war literature dealing with Railway Administration, and the present work is designed to supply an up-to-date treatise on the subject in its modern aspects.

The railways, run by companies before the war, were for the time of the war taken over by the Government and run as a department of State. This necessarily entailed much change of organization, and when, on the conclusion of the war, the Government restored the railways to private management, the restoration was carried out through the *Railways Act, 1921*, which grouped the companies into four great groups, The London, Midland, and Scottish Railway, The London and North Eastern Railway, The Great Western Railway, and The Southern Railway, with consequent further changes in administrative machinery.

The war time also brought into being machinery designed for the adjustment of differences of views that might arise between operating staffs and management on questions of wages, conditions of labour, and on any other points of difference, this machinery of conciliation being now embodied in the above-mentioned *Railways Act, 1921*.

The system of making up the railway goods rates has, after investigation by the Railway Rates Tribunal, been entirely readjusted on a method much more scientifically sound than the older method now superseded.

With increased taxation questions of railway valuation have become of much importance. During the war some advance was made towards solution of such questions and further progress has since been made.

Great improvements have been made in the use of modern machinery at docks for handling goods, and generally in dock administration.

In the compilation of this work, MODERN RAILWAY ADMINISTRATION, the contributors have taken all the new factors into account. The work can therefore fairly claim to hold the position of the most up-to-date treatise on Railway Administration in Great Britain at present available.

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THE EARLY HISTORY OF THE RAILWAY

BY

CYRIL HALL

REVISED BY

F. H. GRAVESON

The Early History of the Railway

CHAPTER I

The Inception of the Railway

"Now, lads, I venture to tell you that I think you will live to see the day when railways will supersede almost all other methods of conveyance in this country; when mail coaches will go by railway, and railways will become great highways for the king and all his subjects. The time is coming, lads, when 'twill be cheaper to travel on a railway than to walk on foot." So said George Stephenson, the unassuming enginewright of Killingworth Colliery, yet one among the greatest agents in modern civilization and prosperity. The words were spoken to a little group of men who were employed by Stephenson, in the shed at Newcastle where his engines were built, a hundred years ago, before the Stockton and Darlington line was completed, and, in fact, before the locomotive had been decided upon as the tractive power to be used.

It is difficult in these days to realize how traffic was carried on in Britain more than a century ago, or what must have been the wonder and incredulity of the north-country crowd that gazed open-mouthed at the unprecedented sight of that odd train of thirty-eight clattering vehicles, which rocked and swayed and jolted with its assortment of passengers, coal, and flour, behind a snorting machine, fearsome with a red-hot chimney, over the rough line that led to Stockton. The opening day of the Stockton and Darlington line was a memorable one. The great fight that commenced then between progress and civilization, and blind prejudice and gross conservatism, too seldom finds the place it deserves in history. In every quarter of the globe the railway has made its prosperous way; in nearly every land it has now to be reckoned as the prime factor in commercial wealth and industry. Steel rails have reflected the light of civilization and freedom in the hearts of primitive and savage lands. Hidden treasures of nature have been adapted by the aid of the "iron horse" to man's needs and comforts. In short, one might almost say that the dawn of civilization, as it is known in the Western World to-day, had scarcely commenced until the awakening of the genius of the Northumbrian collier.

The Growth of the Railway.—It is not, however, till one approaches facts and figures that the real significance of the growth of the railway becomes startlingly apparent. A century ago there were employed in railway work perhaps a few hundred men. To-day 675,000 does not include the full extent of the great army of workers in Great Britain alone. To estimate the number of men employed all over the world in the railway service would be a task not easy to accomplish, but such an estimate would probably number many millions, excluding those other millions of persons who are actually dependent on the railways for their means of existence. In 1875, forty-five years after the opening of the Liverpool and Manchester Railway, there were 274,530 persons directly employed in railway work; in the following forty-five years these figures had been increased by 150 per cent. Even these figures, stupendous as they are, are dwarfed into insignificance by the statistics that show the enormous increase of railways in mileage, expenditure, and receipts.

With its thousands of miles of single track, America can, of course, show figures which are unattainable in any other country. The total mileage of the world is now estimated at well over 600,000 miles. Of this figure more than 230,000 miles belong to the United States of America, and consequently a far larger proportion of America's population is engaged in "railroading" than is the case in this or any other country. Railway matters occupy a far more important place in public thought and affairs there than they do on this side of the Atlantic. It may be said that America's existence depends on the length and strength of her railways. The development of her vast mineral resources, her stupendous steel works and manufacturing industries—one is tempted to add the common necessaries of life—are solely dependent on the railway system.

To the student of railway history the dawn of the nineteenth century must always be fraught with the deepest interest. The epoch of the broad gauge, the fight for the compound engine, or the controversy that raged round the question of ton-mile statistics before they were made compulsory by legislation, are incidents in the story of the railway that dwindle into insignificance when looked upon from the standpoint of the great events in the lives of such men as Murdoch, Trevithick, and the Stephensons, which have made those names immortal throughout the world.

Early Railways.—It is of so much importance to the railwayman of to-day that he should know something of the history of the mighty system by which he earns his livelihood, that it is necessary to briefly relate the events which have led up to the consummation of great railway schemes, before we turn to a consideration of the methods which have been, which are, and which are likely to be employed for the maintenance and continuation of these schemes.

It would be very hard indeed to say definitely when and where originated the first railway; not in the modern sense of the word, nor even in its literal sense, but as the primitive track which must have been employed centuries ago for facilitating the transit of heavy goods in bulk. The Roman "Stone

Roads ", consisting of parallel lines of stone blocks, each from 2 ft. to 6 ft. in length, laid about 4 ft. apart, constitute the oldest known form of track in Britain. Such stones, taken out of the Roman Fosse Road at Leicester, are preserved in Leicester Museum. About the middle of the seventeenth century balks of timber were employed to form a more or less even track, upon which coal carts or trucks travelled. Some years later a man named Beaumont laid the balks of timber parallel after the manner of railway lines. Roger North, writing near the close of the seventeenth century, said: " When men have pieces of ground between the colliery and the river they sell leave to lead coals over their ground, and so dear that the owner of a rood of ground will expect twenty pounds a year for this leave. The manner of carriage is by laying rails of timber from the colliery to the river exactly straight and parallel. Bulky carts are made with four rowlets fitting those rails, whereby the carriage is so easy that one horse will draw down four or five chaldron [1] of coals and is an immense benefit to the coal merchant." These timber rails were afterwards fitted with ledges, to reduce the width of the rail which it was necessary to keep in repair; for as the rails wore very unevenly, repairs and renewals caused serious expense; the ledges served also to keep the wheels on the lines more than was possible without guards of any kind. At Newcastle and Coalbrookdale in 1738 cast-iron plates without ledges were nailed upon the top of the wooden way, and this became the " plated-way ". It was not until 1775 that James Outram introduced the cast-iron angle-section " plateway " without the longitudinal timbers; so that the " plated-way " must not be confounded with the later " plateway ". A little doubt exists as to the date when these angle-section rails were first introduced. Nicholas Wood, in a quaint little treatise on *Railroads*, published in 1825, gives the credit of the first iron railway to a Mr. Reynolds, one of the proprietors of ironworks at Coalbrookdale, in Shropshire.

" Reynolds ", he says, " laid down a line of this description as early as 1767." Other authorities, however, attribute this vast improvement to John Curr, who laid a plateway at the Duke of Norfolk's colliery near Sheffield in 1776. Curr was the duke's colliery manager, and certainly did not invent the plates, which were cast by James Outram at his foundry at Ripley in 1775. The plates were of L section, cast in lengths of about 5 ft., and were known as the " Outram plates ".[2] It seems probable that if, as is commonly held, Reynolds was the inventor of the first iron way, his idea was to use the iron as an adjunct in the shape of a curb to the then common wooden lines. The line laid by Curr marked the greatest advance that had been made up to that time, but was promptly destroyed by indignant colliers, who, finding that fewer horses and men were required, broke the plates and burned the wooden sleepers.[3] The iron rails then in use were rough and very primitive, easily broken, and very expensive; but their adoption must have been very

[1] Chaldron = 53 cwt. [2] Outram sent " platelayers " to lay the line.

[3] Mr. Clement Stretton says, probably with the best authority, that it was owing to such outrages as this that Benjamin Outram, son of James (and father of General Sir James) Outram, first used stone blocks that could not be burned.

wide and rapid, for in 1776, the year that Curr's line was built, we read that a parliamentary committee was appointed to inquire into the methods of constructing, and the accidents upon, these tramways.

Jessop and Outram.—For about ten years the cast-iron plateway seems to have existed without much improvement, and then, quite suddenly, the method of constructing tram lines was destined to see a great change. In 1788 was invented the narrow rail on which ran flanged wheels, such as we know to-day. This revolutionary step was taken by a man of whose existence most persons are unaware, although it is he who, perhaps more than any other, has right to the encomium of the "father of the railway" in its literal sense. This man was William Jessop, the canal engineer, who, in 1789, laid down a line in Leicestershire between Nanpanton and the Loughborough Canal at Loughborough, with the intention of eventually forming a connection with the Ashby coalfield. Rails were cast in 3-ft. lengths of a double-girder section, with a curved lower flange forming what was afterwards called a "fish-belly" rail. The lower flange at one end of a rail spread out to form a foot, which was spiked to a wooden cross sleeper, or, more frequently, to huge stone blocks. The top of this foot is so formed that the next length can be socketed into it, the spiked end of each rail securing the otherwise free end of the following rail. These rails probably weighed about 40 lb. to the yard. On these rails trucks with flanged wheels ran, which greatly facilitated the haulage of minerals. Jessop's railway was a great success, although it is said that his rails had such small wearing surface that both they and the wheels rapidly wore out. Against this statement must be set the fact that at Belvoir Castle Jessop's rails, laid down in 1793, were still in use in 1908. His system was rapidly improved and as rapidly adopted in different parts of the country. The feet by which the rails were attached to stone blocks very frequently cracked and were broken off, thus rendering repairs and renewals very serious items in the maintenance of a line. Jessop invented the detached chair in 1797. He broke off the damaged feet, and, using the same rails, placed their ends in chairs.

Jessop and Outram were partners in the same iron foundry; but each appears to have championed his particular form of line to the detriment of the other's. Figs. 1 and 2 show views on the Little Eaton Outram-way. Mr. Clement E. Stretton, the greatest authority on early tramways, says that the line was opened in 1795, and formed part of the works of the Derby Canal Company. It was originally intended to employ the Jessop rail, but Outram succeeded in persuading the directors to alter their minds in favour of his system. The line extends from the canal at Little Eaton to Denby Colliery, a distance of 4 miles. The wagons, loaded with 2¼ tons of coal, are taken from the colliery to the canal wharf, where the bodies are lifted off the wheels and placed on barges for conveyance by canal to Derby. Here they are loaded on road trollies, and drawn direct to the house of the consumer. The gauge of the line is 4 ft. 6 in. between the ledges of the plates. The original plates were 3 ft. long, but longer plates were afterwards introduced on parts of the line. The wheels of

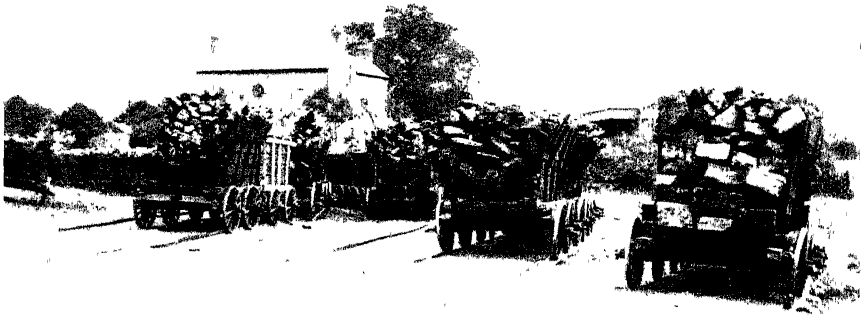


Fig 1 —Little Eaton " Outram-way "

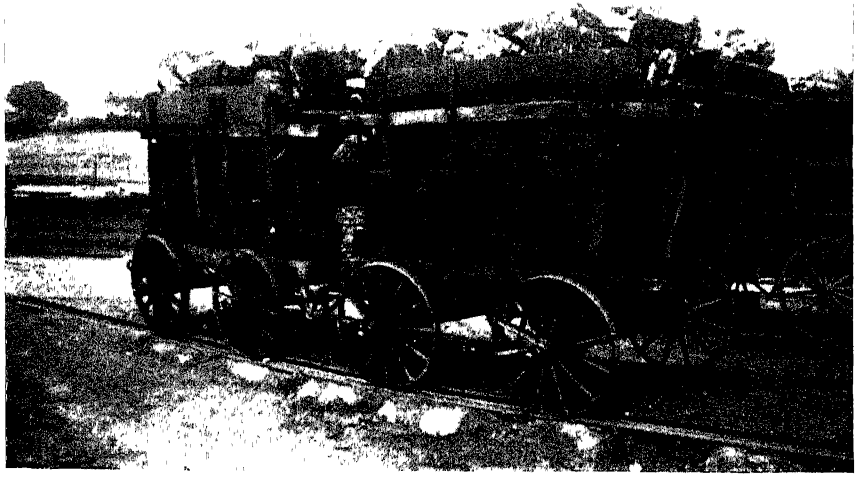


Fig. 2.—Little Eaton " Outram-way "

the wagons are of cast iron, 2 ft. 3 in. in diameter, and, of course, without flanges. After a severe fight the directors of the Ashby Canal determined that a line of railway to be constructed between the canal and the Ticknall lime works should be laid with the plates invented by Outram, instead of with Jessop's " edge-rail way " as originally proposed. Outram's plates were of cast iron in 3-ft. lengths, having a ledge on the inner side to keep the wheels on. This line, 4½ miles long, was laid in 1799. Fig. 3 shows a " turn-out " or passing place on the line near Ticknall. The wheels were diverted by means of tongues called " pointers "—a word since shortened into

Fig 3 —" Pointers " on the Ticknall " Outram-way " (reproduced from Clement E. Stretton's *History of the Midland Railway*, by kind permission of Messrs. Methuen & Co)

" points ". It is commonly supposed that the name tramway is derived from " Outram-way ", but the word *tram*, a beam or bar, is of far more ancient origin.[1]

Cast rails remained in use for several years after this period, although wrought iron had probably been used for a good many years as a facing for the wooden rails. Its cost seriously militated against its use to any great extent. But at this period the railways which had been constructed had given a great impetus to the coal and iron industries, and the increased demand for iron led to the cheapening of the methods of producing it. During the first decade of the nineteenth century wrought-iron rails became extensively used in place of those made of the cheaper but more fragile cast iron.[2] Wrought iron was used in 1820 in the shape of rails of Outram's

[1] Mr. Stretton says that the line was for many years known as the Ashby Outram-way, and that old people in the district still so call it.

[2] The first wrought-iron rail was made at Bedlington in 1805.

angle section, fig. 4, which seems to have been a somewhat retrograde step in view of the fact that twenty-eight years earlier William Jessop had invented the girder-section edge rail. But it must be remembered that in those early days the facilities for rolling rails were of the most primitive kind. So, for a time at all events, the Outram plate came into use again. But it did not stay very long; there were too many defects in it. The flange in the plate added considerably to the frictional surface; the sharp edge hurt the hoofs of the horses which hauled the trucks; and accumulations of stones and dirt, which made a point of getting into the plate, were always throwing the wagons off the line. The next great improvement in iron rails was the coming of the T section in 1815. A comparison of early rail sections is

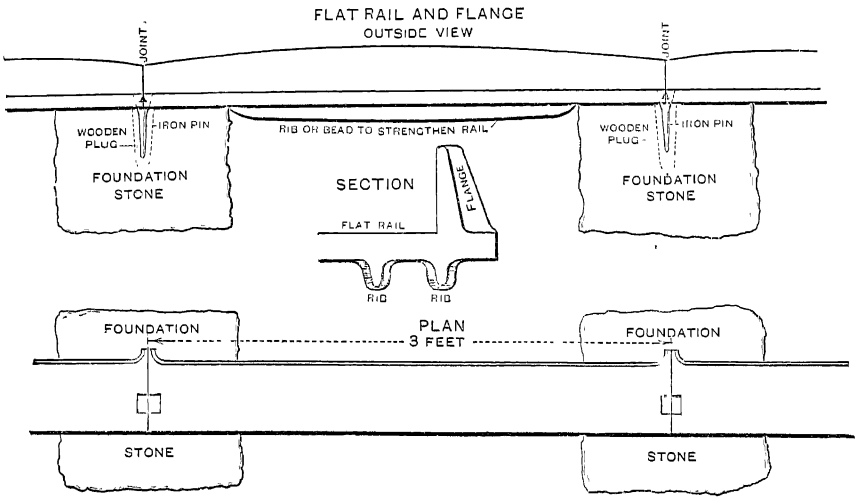


Fig. 4.—The Plateway

shown in fig. 5. As many important events in railway history had taken place by 1815, it is time that we turned back and reviewed them.

The Stage Coach.—When the dawn of 1800 broke in Britain, the country was not wholly unprepared for the wondrous works and changes the century was destined to accomplish. The ironmasters' furnaces were working at full pressure; the coal owners and coal merchants rubbed their hands with satisfaction. Capitalists were ready to put their hands into their pockets to find money for the hundreds of railway schemes which were being floated. In short, the trade of the country was booming, and everywhere people were discussing the prospects and fortunes of railways. In spite of this activity, however, the people had no better facilities for personal travel than before. The stage coach rumbled leisurely across the land, and the canal barge continued to carry its jostling load of country folk returning from market at a neighbouring town. In spite of the improvements which Telford, "the Colossus of roads", as Southey called him, was bringing about in the king's highways, coaching in the closing years of the eighteenth century was a slow and tedious business. Six to seven miles an hour was

the speed averaged by the stage coaches at this time; and with the frequent halts for refreshments, the changing of the horses, and the disinclination for hurry, a journey from London to York was, as may be imagined, not lightly to be undertaken by one whose time was valuable. The following is an advertisement, issued in 1712, of an Edinburgh and London coach:

"All that desire to pass from Edinburgh to London, or any place on that road, let them repair to Mr. John Baillie's, at the Coach and Horses, at the head of Canongate, Edinbro', every other Saturday; or to the Black Swan, in Holborn, every other Monday; at both of which places they may be received in the stage coach, which performs the whole journey in thirteen days, without any stoppages (if God permits), having eighty able horses to

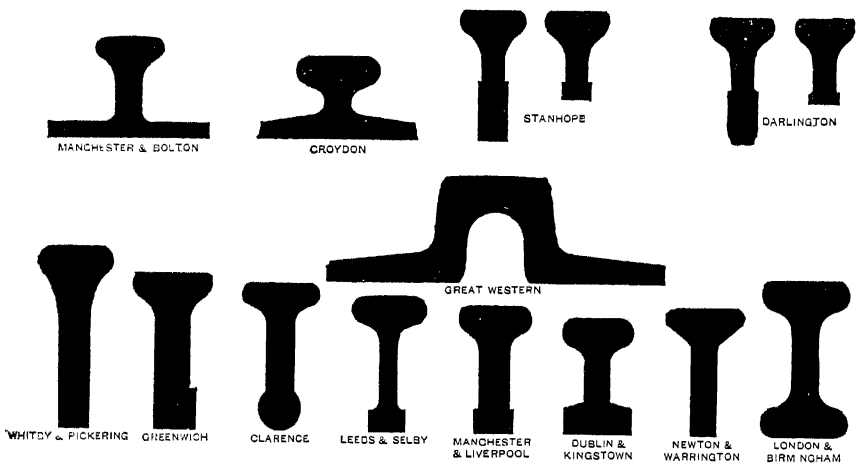


Fig 5.—Comparison of Early Rail Sections

perform the whole journey; each passenger paying four pounds ten shillings allowing each passenger 20 lb. of luggage; all above, 6*d.* per lb. The coach sets off at six o'clock in the morning."

A somewhat similar advertisement issued in 1706 proclaimed that the journey between London and York would be performed in 4 days. By 1770 the time had been reduced to 2 days, and fifty years later to 21 hr. To-day there is a regular non-stop railway run in which the journey is performed in 3½ hr., and even this feat was eclipsed in the summer of 1895 when, on 21st August, the night express from King's Cross to Aberdeen covered the distance from London to York in 3 hr. 2 min. including a stop to change engines at Grantham. Edinburgh was reached in 6 hr. 19 min. and Aberdeen in 8 hr. 40 min.

When Mr. Palmer, the gentleman who was responsible for the introduction of the mail coach, assumed office as Controller-general of the Post Office, the announcement was made that a coach would run daily between London and Bristol which would cover the down journey in 15 hr. and the up journey in 16 hr., and quite a flutter of excitement was made in travelling circles. Changes, however, were not far away. The public was growing

restless and dissatisfied with the existing means of transport. It does not seem, however, to have occurred to any but three or four ingenious minds that the railways might be utilized for the carriage of persons as well as of goods. It must be remembered that all the railways in existence during the period of which we are speaking were merely lines laid down to facilitate the transport of minerals from the collieries and quarries to the nearest waterways. But those isolated spirits to whom we have referred were destined to bring about a revolution in the country's internal communication. They were destined also to bear a burden of ridicule and hatred such as has been rarely cast upon any other figures in history. These men—they can be numbered on the fingers of one hand—were the fathers of steam locomotion.

CHAPTER II

The Coming of the Locomotive

It is a far cry to 1760; but thither the searcher after the first practical attempt at steam locomotion must trace his steps. In the Conservatoire des Arts et Métiers in Paris is a curious-looking machine on three wheels, rusted and tarnished, which nevertheless bears the distinction of being the result of the first successful attempt to move a vehicle along a road of any kind by any other than animal power. Nicolas Joseph Cugnot—may the memory of his genius never fade!—was the inventor of this quaint-looking engine. Cugnot was born in the little town of Void, in French Lorraine, on 26th February, 1725. He was a child of humble parents, and showed a remarkable bent for mechanics. At the age of thirty-five, Cugnot, who had diligently applied himself to the properties of steam, made elaborate experiments with a view to adapting the steam engine to road traction.

It is difficult in these days to form any adequate conception of what must have been the difficulties that lay in the path of such a pioneer of mechanical locomotion as this man Cugnot. Perhaps the trait which stands out most prominently in the characters of these early inventors is the dogged perseverance with which they attacked in turn each fresh difficulty. Cugnot, although provided by Providence with a mind that grasped instinctively mathematical and physical truths, had nothing but the primitive tools and appliances of his generation, indifferent and badly made materials, and a few early books on physics, with which to construct the first self-propelled carriage. Contemporaneously, James Watt and his handful of faithful colleagues were slowly solving the problem of converting heat into mechanical power. No telegraphs, no ubiquitous newspapers or fast steamships, carried the news of Watt's discoveries to the French engineer. In Britain and France two master minds were struggling almost simultaneously with the same difficulties, and the difficulties of 1760 are scarcely compre-

hensible to the inventor of the twentieth century. In 1763 Cugnot had finished his road locomotive. No. 1, however, was not a great success, as indeed Number ones seldom are. Cugnot returned to the attempt, but unfortunately he had not the means for carrying out his experiments. The Comte de Saxe was his friend in need. The Comte had influence and wealth, and, though he had probably little faith in Cugnot's invention, he had great respect for the man's pertinacity; so at last he prevailed upon the French Government to seriously regard the practical value of Cugnot's engine. He himself made the inventor a grant of £800. He obtained for him that rank in the Military Engineers which made it possible to carry on his experiments under the favourable eye of the authorities. It would seem that the second engine was built about 1769, at the same time that a Swiss engineer named Planta was occupied with the same problem. Planta, who was charged by General Gribeauval to examine Cugnot's carriage, found it in every respect better than his own, and Cugnot was then authorized to complete, at the expense of the State, the engine which he had commenced. The engine, when carrying four persons on the common road, attained a speed of $2\frac{1}{4}$ miles an hour. Its great drawback was one which has not yet been overcome by modern engineers, that of the failure of the boiler to supply sufficient steam. It would not run for more than fifteen minutes or so without having to stop to get up steam. One would not perhaps have thought this a very startling result; but it was a result far more startling at that time than many that have emanated from the minds of inventors of later years.

Cugnot's Steam Carriage.—Anyhow, Cugnot had got hold of the right end of that awkward stick—steam locomotion. He had mastered the principles of the steam engine, and he had a very good idea of how those principles might be applied to the movement of vehicles. Apart from the rudimentary defects of his machine (fig. 6)—which was ill-balanced and carried too much weight on the driving wheel—it was a capital little affair. The three wooden wheels—the front wheel, which was the driver, has a serrated surface in order to give a good grip on the road—support a heavy wooden frame. On this frame the boiler—perhaps the weakest part of the engine—is carried. This boiler is made of copper. It is of rather curious shape, and is fitted with an internal fire box and two up-take tubes or small chimneys. There are two single-acting cylinders, and the piston rods are connected by means of a rocking beam, the motion being transmitted directly to the wheels by the connecting rods, which act alternately upon crank pins placed on the spokes of the wheel. More than forty-five years afterwards George Stephenson patented the same idea. The distribution of steam to the cylinders is performed by a four-way cock opened by a tappet motion. Steering was done by means of gearing, and a seat is provided behind the boiler and engine for the driver's accommodation.

Unfortunately the engine brought its inventor to misery and want instead of fortune. Let us imagine the scene. The day of the trial has arrived, and at the spot where the Madeleine now stands are waiting Cugnot and his machine. There is a vast concourse of people, some believing, most

sceptical: the officers of the army; Brezin, who had helped Cugnot to construct his engine; Cugnot's good friend the Comte de Saxe; the Duc de Choiseul; General Gribeauval; and many others as great. The fire is lighted, the steam hisses from the indifferently-packed joints, Cugnot and several others mount the lorry, the valve is opened, and the clumsy carriage moves forward.

We can imagine the shout of encouragement from the crowd, and the feeling of triumph it raises in the inventor's breast The engine is going at 3 miles an hour. However, either Cugnot drove a little recklessly, or the carriage collapsed, and in an ill-fated moment it upset, and there was a con-

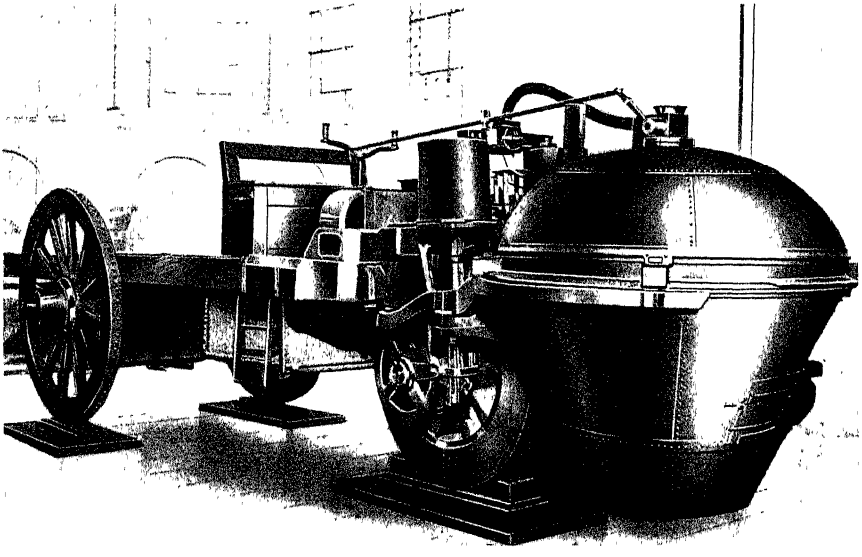


Fig 6.—Cugnot's Steam Carriage
(By kind permission of the Director of the Conservatoire des Arts et Métiers, Paris)

fused mass on the roadway—whirring wheels, struggling men, and boiling water. The good people of Paris were now properly afraid of Cugnot and his dangerous toys; so they put him in jail for a while and locked up his broken engine in the arsenal, in order that it might do no more damage. They soon let the inventor out of jail, but they left him to go a-begging. He was reduced to poverty, although the Government afterwards allowed him a small pension. But the Revolution came and stopped the pension. The rest of the sad story is told by Michael Reynolds, who says that a humane lady of Brussels took pity on the ruined Cugnot, and relieved him until Napoleon I granted him a pension larger than the one he had lost, though only amounting to £42 a year. What truth there is in the story it would be hard to say, for the last twenty years of Cugnot's life are wrapped in obscurity.

Cugnot lived to the age of seventy-nine, and before he died there were several men who found themselves convinced of the possibilities of the locomotive. It is, however, to William Murdoch that we must now turn

in order to trace the locomotive's history in correct chronological order.

William Murdoch.—In 1774, when Watt had been at work on his invention for about nine years, he entered into partnership with Matthew Boulton, and took up his abode at Soho, Birmingham.

The connection is important, for it marks the date of the first business attempt to develop the steam engine; but it is more important still to the student of steam locomotion, for the name of William Murdoch (or *Murdock*, as he latterly spelled his name, to suit the English pronunciation) is as inseparable from the fortunes of Boulton and Watt as it is from the history of the locomotive. William Murdoch was born at Old Cumnock, in Ayrshire, in 1754, and was the son of a local millwright. He was a particularly intelligent lad, and he worked with his father until the fame of his countryman Watt reached him, when his ambition rose, and he determined to gain an entry into the Soho works. So at the age of twenty-three Murdoch trudged to Birmingham and applied at the works for a job. Boulton told him that there was no place vacant, and was about to dismiss him, when he noticed that the young man held in his hand a hat of very peculiar pattern.

"What is it made of?" he asked.

"Timber," replied the awkward youth.

"What, of wood?"

"Ay, man."

"How was it made?" asked Boulton, astonished.

"I turned it masel' in a bit lathey of ma ain makin'."

Boulton, who was a rare judge of workmen, was satisfied, and the young Scot was immediately installed for two years at 15*s.* a week. Murdoch was a born mechanic, and he made himself invaluable to his employers. Both partners had the greatest faith in him, and "William", their most trusted and capable mechanic, eventually became their manager.

Dr. Smiles tells us that Murdoch was by far the ablest and most efficient of the Soho workmen, and that he won golden opinions in all quarters; so much so that he was in constant request. He was soon sent to superintend the erection of pumping engines in Cornwall, and Watt himself described him as "flying from mine to mine, putting the engines to rights". He was active, quick-witted, shrewd, indefatigable, and an excellent workman. Down to 1780 his wages were only 20*s.* a week, and although other steam-engine makers made him offers of partnership, Murdoch remained faithful to the Boulton & Watt firm, and in due time he had his reward. Murdoch, besides being a faithful friend and a loyal servant, was a genius. He invented the famous "Sun and Planet" engine motion, a steam gun, the D slide valve, and he lighted the Soho works with coal gas. And let it never be forgotten that he was the first man in this country to take the problem of steam locomotion in hand.

Watt takes a Patent for a Steam Carriage.—About this time friends of Watt, Mr. Robinson and Mr. Edgeworth—the latter (the father of Maria Edgeworth, the novelist) described as "a gentleman of fortune, young, mechanical, and indefatigable, who has taken a resolution to move

land and water carriages by steam"—and also Dr. Darwin (grandfather of the more famous Charles Darwin), tried hard to indoctrinate Watt with the possibility of steam carriages. Dr. Darwin, who was a bit of a wag, and a member of a local philosophical society founded by Boulton, professed to believe that there was nothing that could not be moved by steam. It is very refreshing to find, among so many well-educated men who at that time regarded the steam engine as an invention of the devil, some who could see into the future. Here is a letter from Dr. Darwin to Boulton. Incidentally it throws a quaint sidelight on the discomforts of travelling in 1778.

"Dear Boulton,—I am sorry the infernal divinities who visit mankind with diseases, and are therefore at perpetual war with doctors, should have prevented my seeing all your great men at Soho to-day. Lord! what inventions, what wit, what rhetoric, metaphysical, mechanical, and pyrotechnical, will be on the wing, bandied like a shuttlecock from one to another of your troop of philosophers; while poor I, I myself I, imprisoned in a post chaise, am joggled and jostled, and bumped and bruised along the king's highroad to make war upon a stomachache or a fever."

Either Watt was too busy to attend to matters beyond those which constantly required his attention in all parts of the country, or else he had no faith in the possibilities of steam traction, for he appears to have lent a rather unwilling ear to the dreams of the friends just mentioned. At length, however, he gave way, and in his patent of 1784 he included a specification of a steam carriage. The design was never carried into effect. Probably had he known that his beloved "William" had been, night after night for months, in the secrecy of his own chambers, designing and building a model steam engine which was to run on wheels, he would have pursued his own efforts. Had he seen Murdoch's tiny "motor tricycle" racing round the bare boards of his room, he would doubtless have been less sceptical of its ultimate results.

Murdoch's Model.—Murdoch, be it remembered, was a Scotsman, and he was not going to let his fellow-workmen at Soho know that he was thinking out a machine in which lay the germ of a power that was destined to move the world. Owing to this reticence it is not at all certain when Murdoch actually commenced to experiment with his locomotive model, but he was probably at work on it between the years 1782 and 1786. He certainly constructed two models, and probably three.

During the years mentioned he was at Redruth, in Cornwall, erecting pumping engines for his employers. His model is now to be seen in the Birmingham Art Gallery (see fig. 7). It is carried on three wheels—the arrangement favoured by Cugnot, though Murdoch had never seen, and had probably not heard of, the Frenchman's trials; but in Murdoch's engine the front wheel was used for steering only, the driving wheels being at the back, and connected by a cranked axle. The boiler (fig. 8) is rectangular, very carefully made, with brazed joints and an internal flue. The fuel used was spirit, which was burnt in a sort of open cup. The motion consists of

a double-acting cylinder, the piston rod working direct on to a beam, which

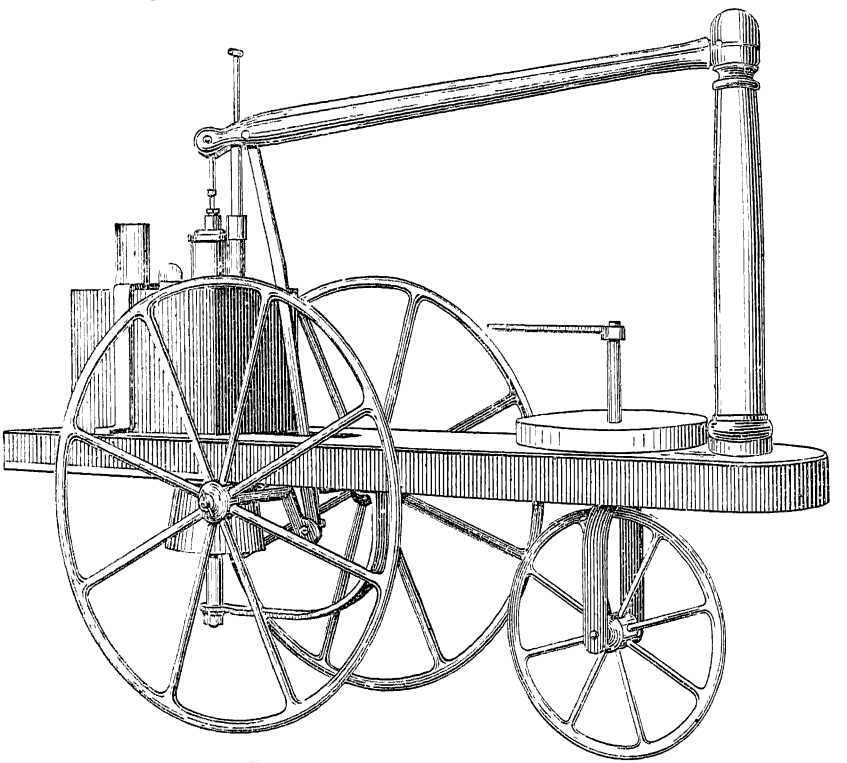


Fig 7.—Murdoch's Model Steam Carriage

transmits the motion to the wheels by means of a connecting rod. The valve is actuated by a tappet, worked by the beam, and enables the engine to run in either direction. The valve itself is made up of two pistons working in a tube, the space between the pistons being always open to the boiler. The exhaust steam escapes through the lower end of a connecting tube.

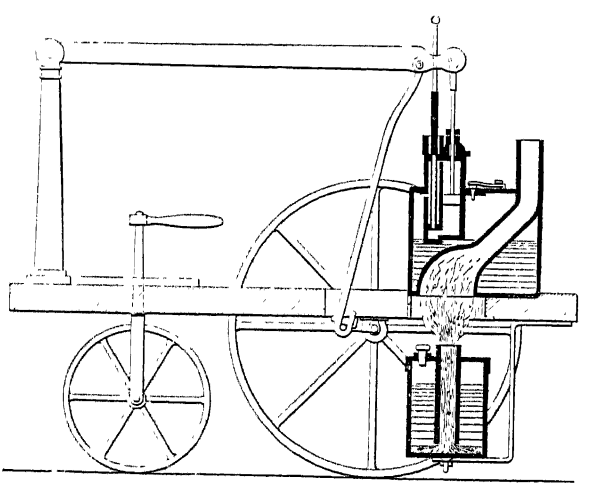


Fig. 8.—Section through Boiler of Murdoch's Model

At length, no doubt, the inventor grew tired of running his engine round and round a room, and decided to give it a trial on the open road. So one

calm evening he brought it down to the straight stretch of road that led past the parsonage at Redruth. The scene must have been a memorable one—more impressive in its way than the flourish that accompanied the trial of Cugnot's engine in Paris. The story of what happened on the quiet road at Redruth is admirably told by Michael Reynolds.

"Murdoch took from under his coat a tinder box and flint; he struck the steel and kindled a fire under the engine. In a few seconds the small spirit lamp was burning, steam was got up, and the trial was found satisfactory. In another minute Murdoch tried it again, and the event of the evening took place. There in the long gravel walk the engine steamed up and down, puffing away and lighting up the sides of the road with its fire; cast on each side of the road was its own image. In the midst of Murdoch's glee and happiness the worthy parson entered the long walk where the engine was running. He offered gold, and blood even, if he could but be restored to the bosom of his own family, for he had encountered the devil, who was loitering near the churchyard. The vicar had no revolver to cock, and therefore had recourse to gestures when Murdoch with a lantern faced him. 'It is not', said Murdoch, 'the evil one *in propria persona*, but the first locomotive.'"

Whether or not the vicar of Redruth gently counselled the inventor to take his locomotive elsewhere we are not told, but Murdoch certainly gave no more open-air demonstrations of the powers of steam when applied to the moving of road vehicles. He went back to safer secrecy, and in 1786 Boulton, writing to Watt, says that Murdoch "had made his steam carriage run a mile or two in Rivers's great room, making it carry the fire shovel, poker, and tongs. William uses no separate valves, but uses the valve piston, something like the 12-in. little engine at Soho, but not quite."

Watt's sensitive nature was hurt at the secrecy with which Murdoch had carried out his experiments, and Boulton was alarmed lest the success of the model carriage should induce Murdoch to leave them. But with kindness as well as diplomacy Watt prevailed upon his manager to leave locomotives alone and attend to the more profitable business they had in hand, and Murdoch does not appear to have built any more models of his steam carriage, or indeed to have carried the problem of the locomotive any further. Although all Murdoch's steam carriages were models, there is evidence to show that the one in the Birmingham Art Gallery is not by any means the largest. Murdoch's inventive genius was always showing itself after he had retired from business a wealthy man. He devoted his time to inventing articles of a hundred different kinds, many of them remotely removed from the steam engine. He survived Boulton and Watt by many years, and died at his house at Sycamore Hill, Handsworth, in November, 1839—a date when the railway and steam locomotive was already a power in the world. Robert Tourners, an engineer of Halifax, is said to have built a steam carriage in 1788, but nothing appears to have been accomplished with it. It is said to have had three inverted cylinders driving on to a crank shaft, which was connected by gearing with the driving wheel.

Trevithick's High-pressure Engine.—After Murdoch came Trevithick. Richard Trevithick took up the nucleus of the steam carriage where Murdoch had left it, and improved it. But he did far more—he saw the connection that might exist between the primitive railways then existing and the steam locomotive. His labours to that end resulted in the production of the first *railway* engine.

Richard Trevithick was, like Murdoch, a born mechanic and a born engineer. It is related that, on one occasion when Murdoch was in Cornwall, Richard's father, a mining captain, made an insulting remark about Watt, whereupon Murdoch challenged him to a duel, and beat him. However, he bore the captain's son no malice, and, taking a fancy to young Richard, adopted him as a pupil, and took a special care in his protégé's advancement. And when Murdoch, with whose steam carriage Trevithick was no doubt familiar, gave up his locomotive experiments on pressure from Boulton and Watt, young Trevithick, who was thoroughly imbued with its practicability, determined to make more of it than either of his predecessors had done.

Trevithick was born in 1771, and could not have been much more than twenty when Murdoch put on one side his model. There is evidence to show that Trevithick had, before he took out a patent for his road locomotive, been endeavouring to invent a stationary engine which should not infringe Watt's patents. He decided, therefore, to abandon the condenser which formed part of Watt's design, and to employ high-pressure steam instead. It was said that the pressure Trevithick used was equal to about 3 atmospheres. In 1797 he built a model in which the high-pressure-steam principle was embodied. It has a double-acting vertical cylinder sunk into the boiler, with the piston rods attached to crossheads, and connecting rods acting directly on the crank pins in the driving wheels. A flywheel was fitted to carry the engine over the dead centres. The valve gear consisted of the old tappet pattern common to all engines of the period. The little engine was simple, compact, cheaply constructed, and was capable of exerting a greater force for its size than had been obtainable with any other engine.

The success of Trevithick's model was such as to induce him to build a full-sized carriage on the same principle. Trevithick joined forces with his cousin Andrew Vivian, and in 1801 a patent protecting the invention was secured by the two men. The new engine was built at Camborne, and there were embodied in it several features of great importance. A horizontal cylinder was used instead of the vertical one in the model, and an elaborate system of gear wheels transmitted the motion to the driving wheels. The piston rod had a forked extension and operated a counter shaft, which in turn gave the motion to a connecting rod working the crank axle, which was placed between the forks of the piston rod. The gear wheels on the crank axle could be thrown out of gear by means of levers. Bellows, worked off the axle, were employed to urge the fire. The engine is worthy of very careful study on account of the manner in which it derived its motion. Trevithick employed high-pressure steam, horizontal cylinder, and crank axle; in other words his design of 1801 included features which are insepar-

able from the locomotives of more than a century later. This engine attracted great attention locally. It snorted its way through the streets of Camborne, and, although there was the difficulty of insufficient steam, Trevithick used to shout to the people to " jump up ", and many persons must have ridden on the first English steam carriage. Although the engine weighed more than a ton unloaded, it is said to have travelled at a speed of from 5 to 9 miles an hour.

Trevithick and Vivian's Carriage in London.—After a time Trevithick wearied of fame which penetrated no farther than the outskirts of his native town, and Vivian began to look for some return on the money he had invested. A new engine was built, or the original engine was reconstructed, and Trevithick set off with it to London, if not to seek his fortune, at all events in the hope of being able to convince the great world of commerce of the vast possibilities of this novel vehicle. The carriage travelled by sea from Plymouth to London, and its arrival in the metropolis aroused great public interest. Two famous Cornishmen, Davies Gilbert, then President of the Royal Society, and Sir Humphry Davy, welcomed the inventor and were much struck with the performances of the engine. Sir Humphry Davy wrote to a friend that he hoped soon to hear that the roads of England would be the haunts of Captain Trevithick's " Dragons ". The carriage was allowed by the authorities to run up and down Oxford Street, where it appears to have done considerable damage to property.

From the spectacular point of view the exhibition was a great success. Trevithick's object, however, in coming to London was not that of entertaining a wonder-loving multitude; his ambition was to make his carriage a commercial success, and this he failed to do. If in those days the scope of mechanical engineering was limited, the public imagination regarding steam engines was still more limited. It could not foresee that Trevithick's idea might eventually be vastly improved upon, or that half a century would be responsible for the complete revolution of methods of transport. The merchants failed to see in the steam carriage any improvement upon horses. The engine was uncertain, 5 or 6 miles an hour was not an uncommon speed for horse traffic, while horses had no boilers which were liable to burst, and it was easier to find ostlers than engineers. On the whole, perhaps, one must not blame the merchants for their shortsightedness.

The outcome of Trevithick's visit to London [1] was of little value to him, and he and Vivian returned to Cornwall with the steam carriage, disgusted and disappointed men. But while he was in London a great idea occurred to Trevithick. Someone was laying wagers as to the weight that could be drawn by a single horse on the Surrey tramway, an iron plateway from Wandsworth to Croydon which was then under construction, and though

[1] Trevithick again went to London six years after his first visit. This time he took with him a railway locomotive, and a circular track was laid on some ground where Euston Square now stands, on the site, in fact, of the North-Western terminus. Here public exhibitions were held, and many persons had rides in a carriage attached to the engine. Thus " Euston " was associated with the railway locomotive in 1808—long before the terminus of a great railway system and the Railway Clearing House had made it famous throughout the world.

he seems previously to have had an idea that the steam carriage might be employed on the railway, the possibilities that lay in this direction came back to the inventor's mind like a revelation. He determined that his engines should supplant horses as the power used for hauling trucks on the railway.

The First Railway Locomotive.—Trevithick had been employed in 1801 in erecting blowing engines at an ironworks at Pen-y-darran, in South Wales. Mr. Humphrey was the proprietor of the works, which were connected by means of a tramway with Merthyr Tydvil, a distance of about 9 miles. When Richard, who returned from his London disappointment with his head full of schemes for running engines on rails, turned up at Pen-y-darran again in 1803, Humphrey aided and abetted him to build the first railway locomotive.

Considerable doubt exists as to the precise nature of the specifications for this locomotive. There is some ground for believing that Trevithick departed considerably from the design of his steam carriage, and that he adopted for the Pen-y-darran engine a vertical cylinder, with the motion on the top of the boiler, which was set in brickwork after the manner of a stationary Cornish boiler. Other authorities state that his boiler was fitted with a steelyard safety valve, and a mercurial pressure gauge, articles which belonged exclusively to the stationary-engine trade. There is no doubt that between 1803 and 1805 Trevithick built several locomotives, and as his brain was very versatile, and his plans very fickle, they were all more or less unlike. In the absence of absolute proof it is fairly safe to assume that the engine of which photographs are preserved in the South Kensington Museum was actually the first rail locomotive built by Trevithick which gave any practical results (fig. 9). It was constructed towards the close of the year 1803, and was tried on the Pen-y-darran plateway in 1804. Reliable authorities, among them Rees Jones, who helped to build the engine, state that this engine weighed about 5 tons, and could haul a useful load of 13 tons at about 5 miles an hour. The locomotive had a horizontal cylinder sunk into the cast-iron boiler, which was 6 ft. by 4½ ft. with a wrought-iron furnace flue. The piston-rod crosshead moved on a round guide bar, and the connecting rods passed to cranks on the fly-wheel shaft, which carried a small deep-toothed gear wheel, engaging with a large intermediate gear wheel, which in turn engaged with spurs on each of the driving axles. Thus the whole weight of the engine was rendered available for adhesion. The driving wheels were

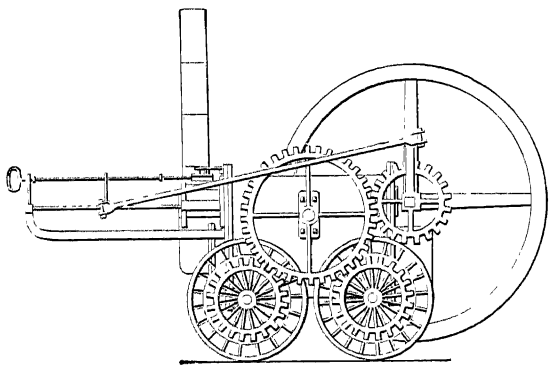


Fig. 9.—Trevithick's Pen-y-darran Tram Locomotive

geared to revolve at the same speed as the crank shaft, so that the tractive effort was about 4 lb. per pound of mean steam pressure in the cylinder. The coal consumption was about 25 lb. a mile. The exhaust steam was a nuisance when exhausted into the air, so Trevithick carried it through the water tank and led it into the chimney. It will be seen that he appears to have been on the verge of two great discoveries, the value of heated feed water and the blast from the exhaust, but it is exceedingly doubtful whether the inventor was at the time aware of the practical value of either of them.

A Contemporary Account of the Trial.—A Bristol newspaper, dated 3rd March, 1804, describes the trial of the Pen-y-darran locomotive in the following manner: "On Tuesday last (22nd February) a trial was made of one of Mr. Trevithick's steam engines at Merthyr Tydvil, for the purpose of ascertaining its powers in drawing and working carriages of all descriptions on various kinds of roads; and it was found to perform to admiration all that was expected from it. In the present instance it was made use of to convey along the tram road 10 tons weight of bar iron from Pen-y-darran ironworks to the place where it joins the Glamorganshire canal, upwards of 9 miles distant; and it is necessary to observe that the weight of the load was soon increased from 10 to 15 tons by about seventy persons riding on the trams, who, drawn thither (as well as many hundreds of others) by invincible curiosity, were eager to ride at the expense of this first display of the patentees' abilities in that country. The engine differs from all others yet brought before the public by disclaiming the use of condensing water, and discharges its steam into the open air. It takes much less coal to work it, and it is only necessary to supply a small quantity of water for the purpose of creating the steam. It performed the journey without feeding the boiler or using any water, and will travel with ease at the rate of 5 miles an hour." Commercially the Pen-y-darran locomotive was a failure. The fault did not lie with the engine, which was undoubtedly capable of useful work, but with the plateway, which was not strong enough to bear the heavy weight of the engine. The rails were constantly breaking, and at last the locomotive ran off the lines into a ditch and had to be dragged home by horses.

The natural remedy for this state of things would have been to strengthen the rails, but popular feeling towards the engine was very hostile, being stirred up by the workmen and those whose interests were in horses, and Trevithick and Humphrey, fearing strikes and worse disturbances, decided that the locomotive should be abandoned at Pen-y-darran and the engine employed for stationary purposes.

Trevithick then went north. In the same year (1804) he visited Gateshead and arranged for an engine to be built there. In the following year another locomotive was built for Mr. Blackett of Wylam Colliery—a place famous in the history of the locomotive. The Wylam engine (sometimes called the "Newcastle" engine) was similar to that built in Wales, with the exception that it had flanged wheels and was probably the first therefore to run on narrow rails (fig. 10). The rails were not strong enough to carry the weight of this engine, about 4 tons, and for this reason it was only a

partial success. These results told severely on Trevithick's patience and perseverance. He was heart-broken, and made no further efforts to improve the locomotive. For a time he retired to his pumping and mining machinery, but in 1816 he went to South America and took with him powerful steam engines for use in the Peruvian mines. His return forms one of the saddest and most tragic stories to be found in the biographies of great men.

Trevithick's Return from Colombia.—Robert Stephenson, who had gone to Colombia on a mining project, was on the point of returning home, after successive attacks of fever, in 1827. While at Cartagena, where he had to wait some time for a ship, Stephenson met Trevithick in the bare, comfortless, and filthy public room of the miserable inn in which he had to pass his time. Great was his surprise when he discovered that a tall, gaunt man, shrunken and hollow cheeked, shabbily dressed, and apparently

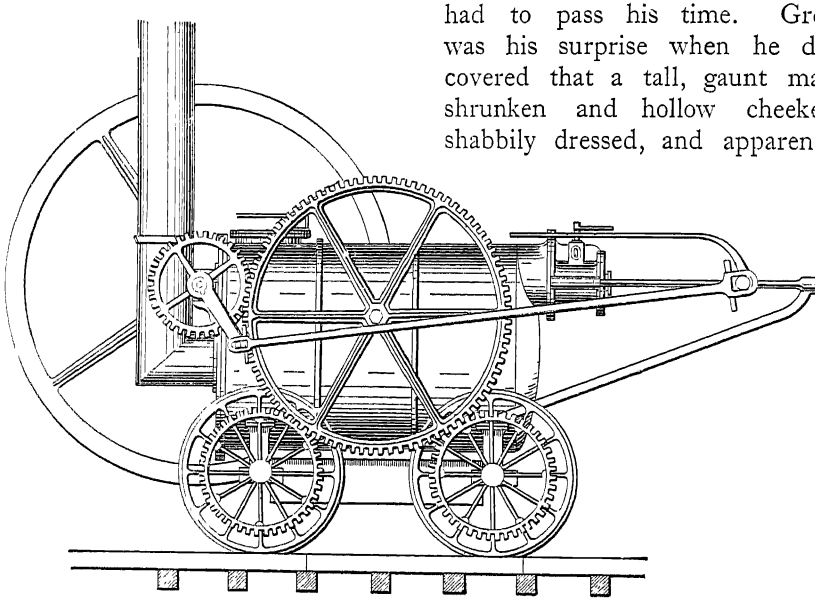


Fig. 10.—Trevithick's Wylam or "Newcastle" Locomotive (the first to have flanged wheels)

poverty stricken, who was also staying at the inn, was the mighty Richard Trevithick, the builder of the first railway locomotive. Trevithick was reduced to his last shilling. He had been met with almost a royal reception on his landing at Lima eleven years before. A guard of honour was appointed to attend him, and it was proposed to erect a solid silver statue of Don Ricardo Trevithick. He had speculated in gold mines, and had realized the truth of the Spanish proverb that "a silver mine brings misery, and a gold mine ruin". He had lost everything in his journey from the interior, and had been compelled to ford rivers and wander through forests and fever-laden swamps in order to reach the coast. He was in despair, and what would have become of the famous Cornishman if he had not chanced to meet Stephenson, who lent him money to return home, there is no knowing. But even then his misfortunes were not ended, for on the voyage from Cartagena to New York both he and Stephenson were wrecked, and narrowly

escaped drowning. He retired to his native town and spent the rest of his days in quietude. His troublous life was ended in 1833.

Blenkinsop's Rack Locomotive.—For several years after Trevithick gave up the locomotive there is no historical record of anything having been done with it. In 1811 John Blenkinsop came to the rescue with a patent which provided for a rack laid down alongside one rail, the object being to secure better adhesion. Blenkinsop was not a practical engineer, and he secured the assistance of Matthew Murray with regard to constructional details. Murray was responsible for a valve which afterwards became

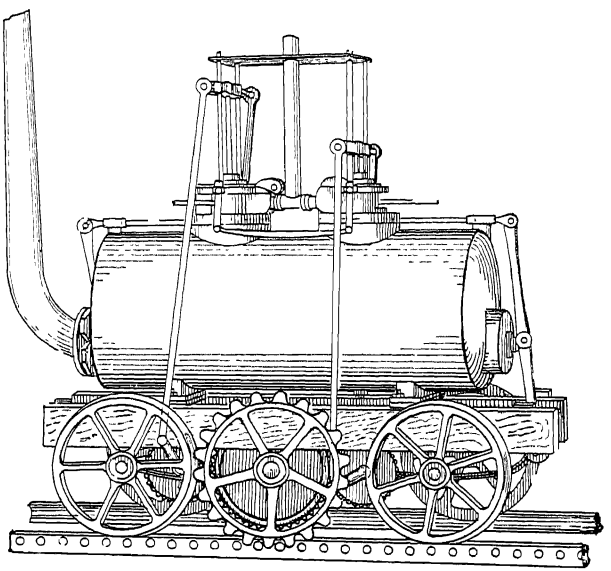


Fig. 11.—Blenkinsop's Rack Engine

almost universally used. This valve is known as the short D slide valve and is an improvement of the long D slide valve.

During 1812 and 1813 Messrs. Fenton, Murray, & Wood built three or four engines on Blenkinsop's rack principle, his line having been laid down between Leeds and the Middleton Colliery, where the engines worked remarkably well. Indeed it may be said that Blenkinsop's rack engines were the first to become financially successful. Matthew Murray had suggested that two cylinders should be employed. Each of these cylinders worked on a separate beam so connected that the cranks were at right angles thus preventing any difficulty in starting. The general appearance of the engine can be seen from fig. 11. The two crank shafts were connected by gearing with an intermediate shaft, and on one side of this shaft was the pinion which engaged with the rack rail. One of these engines weighed about 5 tons, and is stated to have done the work of sixteen horses in twelve hours. It would take a load of 94 tons at a little over 3 miles an hour, or 15 tons up a gradient of 1 in 20. On a level with a light load it is said to have attained speeds of

10 miles an hour. A pound of coal in Blenkinsop and Murray's boiler evaporated 67 lb. of water. Blenkinsop made a mistake in providing a rack on one rail only. Had two racks been provided—one on the inside of each rail—there would have been far less trouble from broken rails and racks, which were the engine's chief disadvantages. By this time, however, there were quite a number of coal owners in the north who had become delighted with the merits of the locomotive. The want of adhesion of a smooth rail was a bogey, however, which continued to trouble engineers.

In 1812 the Brothers Chapman of Newcastle took out a patent for an engine similar in many respects to Blenkinsop's, but which, however, worked on a chain. The engine had smooth wheels, but one of the axles was provided with a grooved drum around which the chain was wound. The device was ingenious, but clumsy and expensive, and although an engine seems to have been built on this principle it was soon abandoned.

There is a fascination about this period of the story of the coming of the locomotive that tempts the historian to dwell on it at greater length than that which even the wide scope of this book allows. The commonplace, everyday incidents in the lives of these men are all worthy to be recorded and are all history. An hour or two spent in the railway section of the South Kensington Museum conjures up visions of the engineering heroes of the early nineteenth century struggling against what appeared overwhelming circumstances to perfect their ideas and inventions, and to bring to a practical end the machine that they knew would some day form a great factor in the improvement of the whole economic aspect of their country.

With the exception of a few early books—several of them now very scarce—the material for lives of the railway pioneers is sadly deficient. To collect the widely distributed facts and figures spread over a great number of years—many of the documents being hidden from the public eye in private dispatch boxes and family histories—would be a labour involving a great deal of time and a great deal of trouble. And in the end it is not improbable that the result would be still unsatisfactory. To do justice to each step in the locomotive's career, and to each hand and mind guiding it step by step, would require the labours of a more unprejudiced historian than has yet been found. It has been the object of this little sketch to trace back, as briefly as possible, the inception and the early career of the locomotive. It has been shown that the locomotive matured slowly. Nearly fifty years elapsed between the ill-starred steam carriage of Cugnot, the Lorraine engineer, and the successful engine John Blenkinsop built at Leeds. Perhaps one reason why the progress of the locomotive was so slow is to be found in the fact that the Peninsular war, while it impoverished the country, caused all attention to be directed towards the armies on the Continent, and allowed no thought of internal advance.

The improvements of the Blenkinsop engine took half a century to bring about. But we are standing upon the threshold of a new locomotive era. The next chapter will show that when William Hedley tackled the

problem events of importance followed in rapid succession, and that the locomotive grew in health and strength as it had never done before.

CHAPTER III

1813–1825

Mr. Christopher Blackett was the proprietor of Wylam Colliery, near Newcastle. Wylam was connected with the River Tyne by means of a tramway 5 or 6 miles in length. This tramway was one of the oldest in the North of England, having been first made of wood, then of wood shod with iron, and finally converted to a railway of angle-iron rails. Christopher Blackett was one of the few men who had a good word to say for the early locomotive. He had heard of Trevithick's engine at Pen-y-darran, and he had no doubt seen the steam-carriage trials in London, and he decided that he would give the locomotive a trial at Wylam. So he wrote to Trevithick inviting him to come north, with the result that in 1804 Trevithick designed a locomotive for Wylam, which was built by Whinfield of Gateshead in 1805, and is described on p. 21. This engine, as we have already shown, did not work successfully on the wooden rails at Wylam, and Trevithick returned in disgust to Camborne.

It was a great blow to him, and it was a great blow to Blackett. Blackett, however, was not the kind of man who allows himself easily to be beaten. The possibilities of steam locomotion were fairly ingrained in his mind, and he determined that when the time was ripe, and the locomotive and the railway had been more fully developed, he would make another effort to supplant horses on his tramway. As it happened, the Wylam horses were supplanted before the locomotive was ready to take their place. The war was in full swing, the price of forage was tremendously high, and good horses were at a premium. Blackett had to sell his horses for military purposes, and the wretched hacks which had to take their places were worse than useless. On the Croydon tramway mules were being used—it was reported with success—and Blackett decided to give mules a trial after his horses had gone. They were, however, as unsatisfactory as the lean horses, and recourse was then had to bullocks.

Hedley's Test Carriage.—In 1812 Blackett thought that he saw a way out of his transport difficulties. The Blenkinsop locomotive was at work at Leeds, and the proprietor of Wylam realized more than ever that a locomotive would be invaluable to him. The engineer at Wylam, famous William Hedley, was, however, sceptical as to the results of the Blenkinsop and Chapman engine. It is possible that if he had not been spurred to action by Blackett, Hedley would never have done very much to further the cause of the locomotive. He was a man of retiring disposition, a little

afraid of failure, and he knew that there was something radically wrong with the locomotives that had then been built. It was not the engine nor the boiler which was at fault, and Hedley had a very shrewd suspicion that the bogey about the want of adhesion was at the bottom of all the trouble. He determined that before he attempted to build a locomotive he would dissipate the fallacy that a heavy engine with a smooth wheel in contact with a smooth rail would not give sufficient grip to propel a train. Hedley's name must always loom large in the list of locomotive pioneers. The device which he employed to test the adhesion of a smooth wheel on a smooth rail is carefully preserved in the South Kensington Museum. It consists of a frame supported on four wheels (fig. 12). On each of the axles is a gear

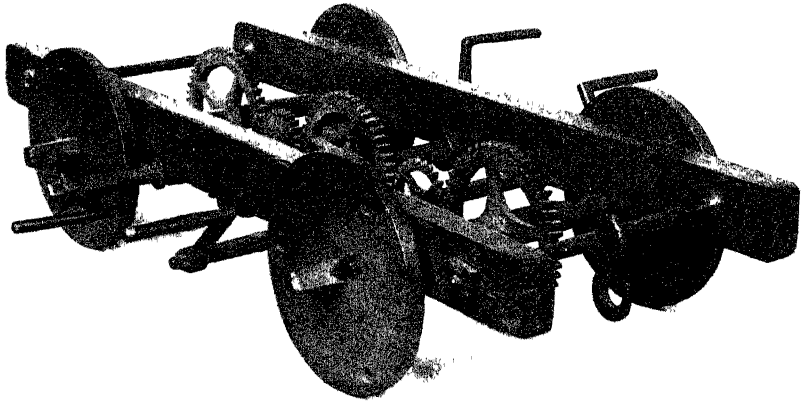


Fig. 12.—Model of Hedley's Carriage for Testing Adhesion

wheel, which engages by means of two smaller gears with a large central spur; the motive power was derived from men who stood on a step at the side of the carriage and turned winch handles on the intermediate gear wheels. The frame was loaded with pigs of iron to a weight equivalent to that of an engine and boiler. Latter-day readers may smile to be told that the test carriage was a great success.

"Puffing Billy."—If Hedley was pleased with the result of his experiment, so also was Mr. Blackett. He suggested that an engine and boiler should be put upon the frame, and then there would be no more trouble about the transport of his coal trucks. In that he was mistaken, for although an engine was built to Hedley's plans it was not a success. It had a cast-iron boiler and a single cylinder, and, like many of its fore-runners, it suffered from want of steam. But Blackett was not to be discouraged. He had set his heart on the possession of a practical locomotive—one that would beat Blenkinsop's and all the others—and he meant to have it. So Hedley set to work again, and in 1813—assisted by the enginewrights at Wylam: Jonathan Foster, Timothy Hackworth, and Thomas Walters—the famous "Puffing Billy" was built. That "Puffing Billy" was anything but beautiful

can be seen from fig. 13; but that it was exceedingly useful and a great step in locomotive science there can be no doubt. The boiler was of wrought iron, carefully riveted, and possessing an internal return flue—one of the improvements noted in Trevithick's engine. The grate area was 6 sq. ft., and the total heating surface of the boiler 70 sq. ft. The driver and fireman stood at opposite ends of the boiler. The motion of "Puffing Billy" was probably superior to any that had been employed in earlier engines. There were two steam-jacketed vertical cylinders. The connecting rod, which was on the transverse centre line of the boiler, worked on to a spur wheel placed

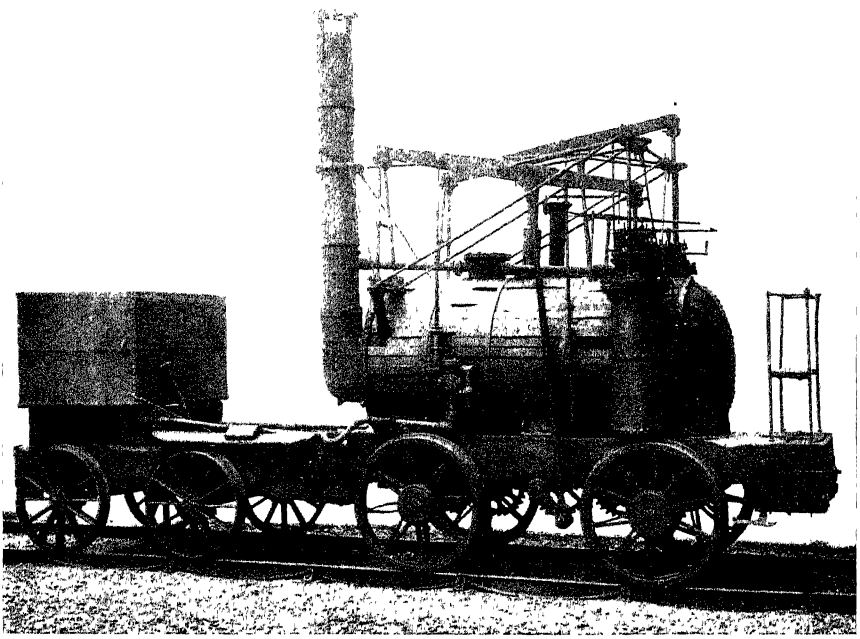


Fig. 13.—Hedley's "Puffing Billy"

midway between two others; these in turn being geared to the driving wheels. Two years later "Puffing Billy" was rebuilt as an eight-wheeler owing to the weakness of the plateway, the rails of which weighed about 36 lb. to the yard. In the modified engine two more intermediate pinions were introduced. In 1829 the Wylam plateway was relaid with edge rails, and "Puffing Billy" was again altered, this time to his original form. The engine continued at work until 1864 or thereabouts, and was removed to the South Kensington Museum in 1865. "Wylam Dilly", a sister engine, built about the same time, worked until 1867, and is now preserved at Edinburgh. When "Puffing Billy" and his sister were first introduced, they met with by no means such unanimous favour as Blackett had hoped they would. On the contrary, the Wylam engines came to be regarded as nuisances which must be dealt with in no hesitating way. The exhaust

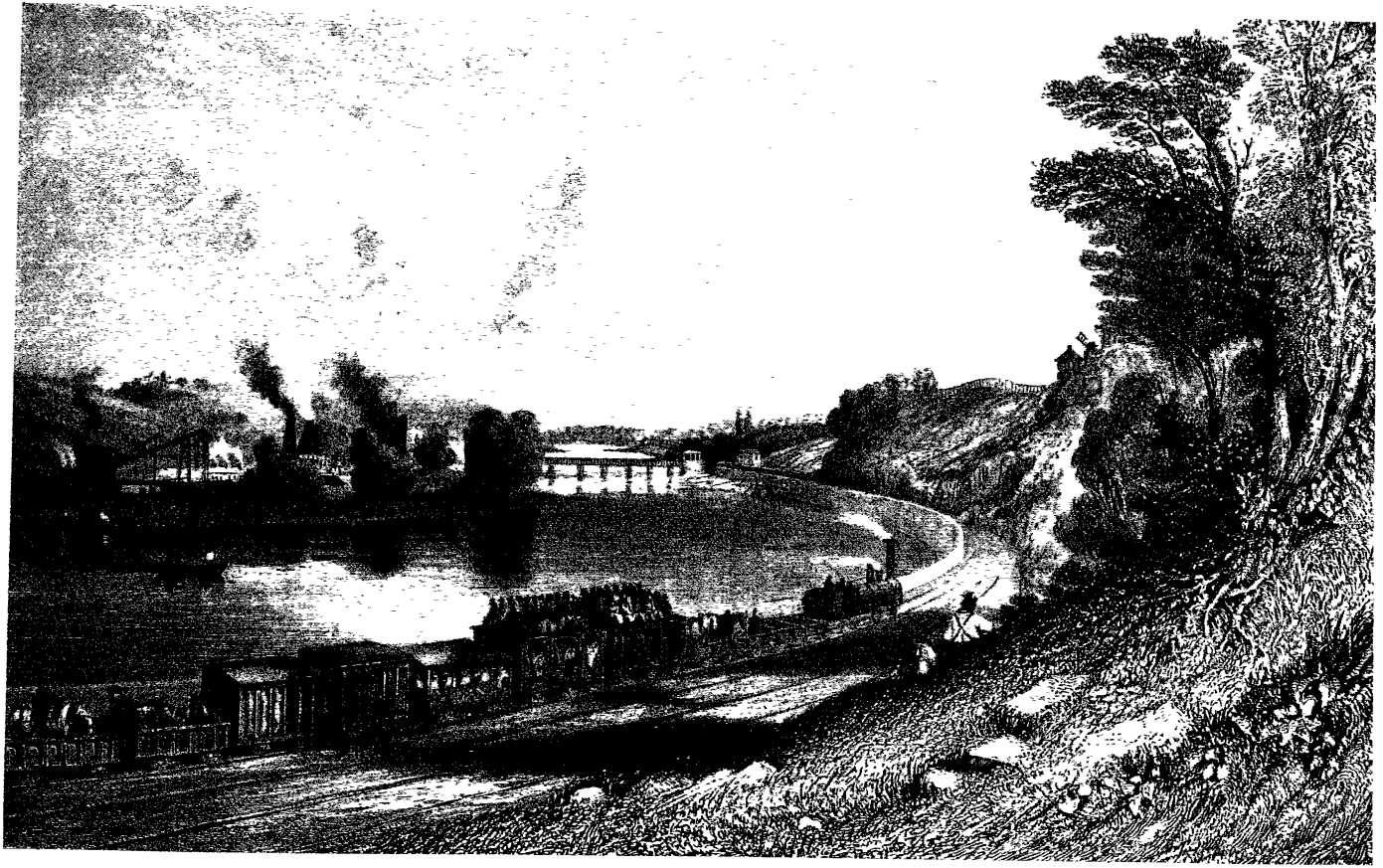


Fig. 14.—A Train on the Railway at Wylam

steam made a tremendous noise when it was discharged into the air, the chimney used to get red hot, and the imperfect combustion caused the air to be filled with thick smoke and live cinders. Blackett became alarmed at the irritation this engine caused, and took the advice of his lawyers, who recommended that the nuisance must be abated. The result was that Hedley set to work to design a " silencer ", which is now to be seen mounted on the boiler at the front end. This " silencer " was merely a condensing box, into which the steam was discharged, and the pressure of it reduced before it was permitted to reach the atmosphere.

A typical example of a train running on the railway at Wylam at a later period is shown in fig. 14.

Timothy Hackworth.—It will not be out of place here to give a few details of the life of one of the men who helped to build the Wylam engines. This was Timothy Hackworth, a man whose name should never be forgotten in connection with the story of the locomotive's development. As a rule, Hackworth scarcely gets the credit he deserves for his share in helping to perfect the locomotive in the days of its precarious infancy. Timothy Hackworth was born at Wylam in December, 1786, his father, John Hackworth, being foreman smith at the colliery. At the age of fourteen Hackworth was apprenticed as a smith. His father died two years later, and Timothy had to undertake the support of the family. He was so skilful a mechanic and so conscientious a worker that his progress was exceedingly rapid. His inventive skill was considerable even at an early date, though he did not give it full scope until after he had left the service of Mr. Blackett. At the time of the construction of " Puffing Billy ", and indeed of the experimental engine built earlier, he acted as Hedley's chief mechanic and right-hand man. In the year in which George Stephenson built " Blücher " for the Killingworth tramway, Timothy Hackworth appears to have quarrelled with Mr. Blackett, and to have left Wylam for Walbottle. In later years Hackworth came into close connection with George Stephenson. In 1825 or thereabouts, after the establishment of the Forth Street works at Newcastle by Stephenson, Hackworth took charge of the business in Stephenson's absence on one of his many schemes. Stephenson later induced him to accept the post of resident engineer of the Stockton and Darlington Railway. The appointment is thus entered in the Company's minutes:

" 1825, May 13th, John Dixon reports that he has arranged with Timothy Hackworth to come and settle on the line, particularly to have the superintendence of the permanent and locomotive engines. The preliminary arrangement as regards salary is £150 per annum, the Company to find a house and to pay for his house rent and fire."

It was while acting in this capacity that Hackworth undertook to alter and improve for the directors of the Stockton and Darlington Railway one of the engines which had been built by Wilson, and which had proved unsatisfactory. This engine was " Stockton No. 5 ", and although it belongs to a period which has not yet been reached in this sketch, a description of

it is here given. No. 5 was built in 1826. It originally had four vertical cylinders, and was carried on four uncoupled wheels (fig. 15).

Hackworth began the reconstruction in 1827, and renamed the engine "Royal George" (fig. 16). He increased the heating surface of the boiler by introducing a return flue as used both by Trevithick and William Hedley, retaining the original boiler shell, which was 13 ft. long by 4 ft. in diameter. Hackworth discarded two of the four cylinders, the other two being arranged vertically over the trailing wheels, the wheels having been increased to six in number. A loose eccentric, worked off the valve shaft, formed valve

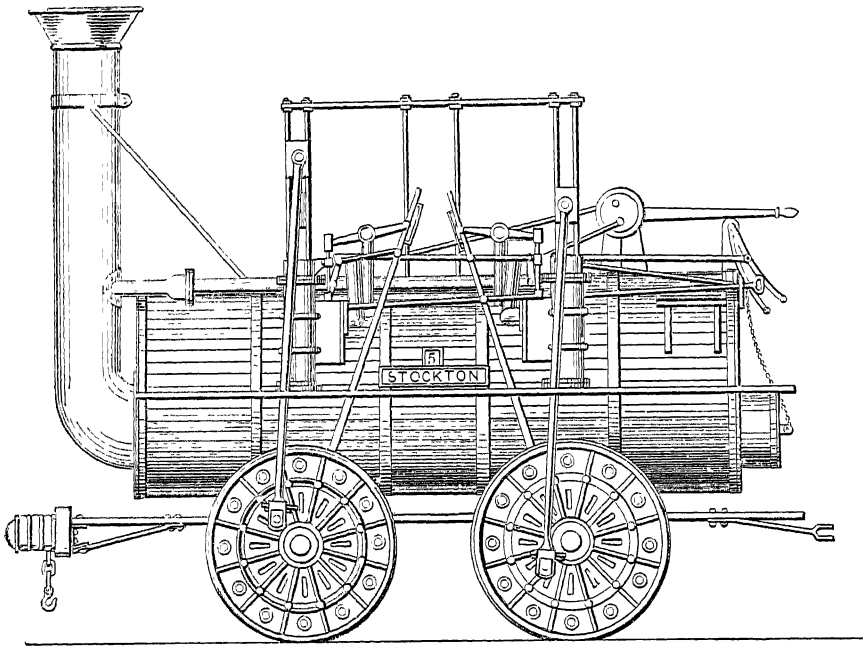


Fig 15.—"Stockton No 5"

motion and reversing gear. Four of the six coupled wheels were mounted on springs, which also acted as balance beams. The "Royal George" worked on the Stockton and Darlington line until 1840, when it was sold to a colliery company for more than it had originally cost. This was the first instance of a locomotive being provided with six coupled wheels, although Stephenson's "Experiment" (fig. 17) built in the same year was a great improvement on the "Royal George". Hackworth died on July 7, 1850, at his house at Shildon, after he had built at his own establishment, Soho Works, Shildon, some very fine locomotives. He was of a retiring disposition, deeply religious, and devoid of the business instinct which was one of the factors of Stephenson's greatness. It is this reason, probably, that accounts for the small place he generally finds in history. He was one of the finest mechanics of his time, and, as he had a rooted objection to adopting devices and inventions of others. it may be taken that the multitude

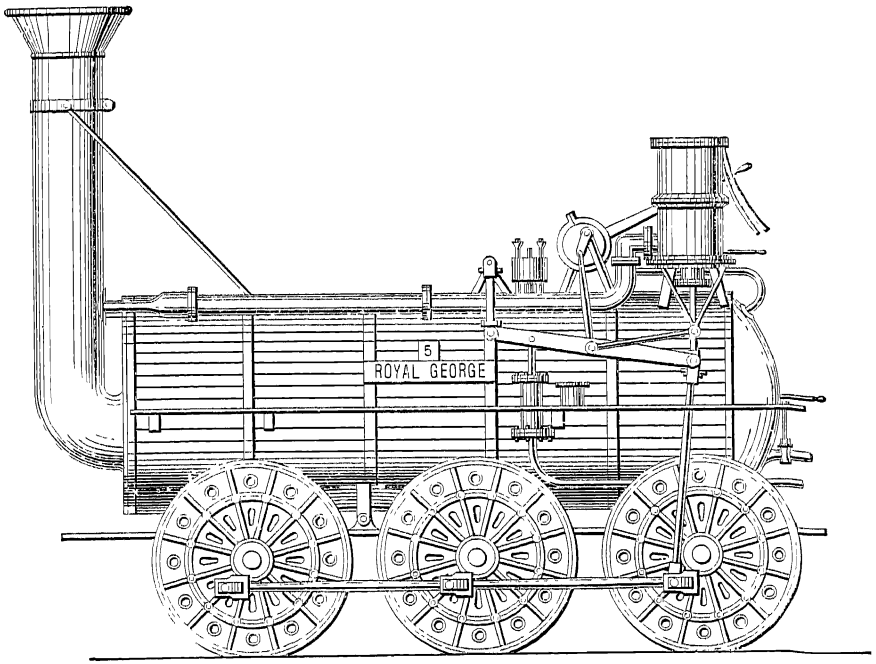


Fig. 16.—" The Royal George "

of improvements which are to be found in Hackworth's engines were the products of his own fertile brain.

During the while that Hedley and Blackett were evolving a successful locomotive at Wylam, each experiment that they made each step in the

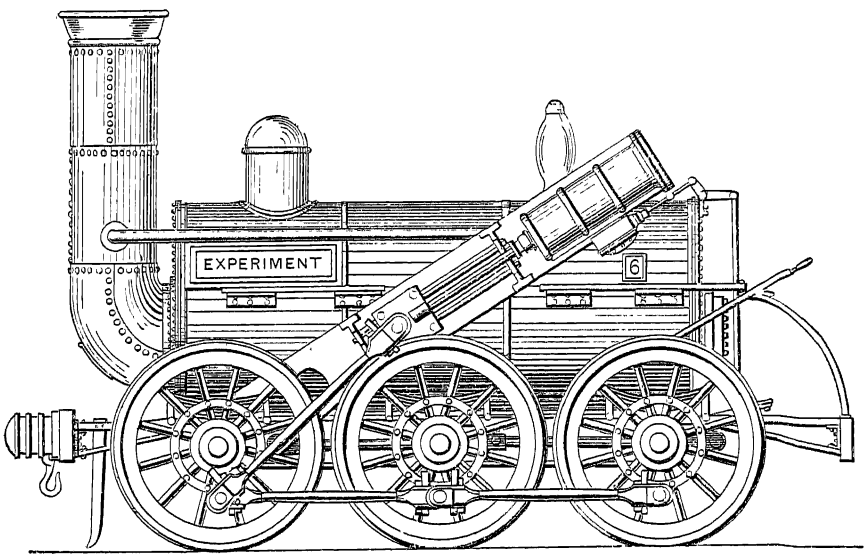


Fig. 17 —Stephenson's " Experiment "

progress of the science of steam locomotion, was carefully weighed and considered and mentally retained by a man who was destined to stand out as the most prominent figure in the industrial advancement of the nineteenth century.

George Stephenson's Birth and Training.—George Stephenson was born at Wylam—"in a common two-storied red-tiled rubble house (fig. 18), portioned off into four labourers' apartments"—on the 9th of June, 1781. He was the second of six children, and as his father's wages as fireman only amounted to twelve shillings a week there was little to spare for clothing

Fig 18.—Stephenson's Birthplace
(From Dr Samuel Smiles's *George and Robert Stephenson*, by permission of Mr. John Murray)

and nothing for education, so that none of the children were sent to school. When George was eight years old the family removed to Dewley Burn, where he obtained as a cowherd his first employment, earning wages of twopence a day. During his spare time he would make whistles out of reeds, or tiny mills in the streams that ran into Dewley Bog; but his favourite amusement was making clay engines with his playmate Bill Thirlwall. Later on he was employed to work on a farm; but the height of his youthful ambition was reached when he was taken on at the colliery where his father worked, first as a corf bitter and afterwards to drive the gin-horse. He was later employed for the same purpose at Black Callerton. At fourteen years of age he was, to his great joy, appointed assistant fireman, but, the coal at Dewley being worked out, the family moved to Jolly's Close, where he had the same position. This pit, however, proved a failure, a new pit being

opened at Water Row, where George was taken on as engineman. He was thus, at the age of seventeen, occupying a higher position than his father. When he was eighteen he found that to advance further he would have to learn to read, so he attended a night school in the village of Walbottle. There he learnt to read and to write his name; but being also anxious to study arithmetic he attended, in 1799, a school at Newburn kept by Andrew Robertson, where he made rapid progress.

While he was working at Water Row Pit he learnt the art of braking an engine, which was among the highly paid branches of colliery labour. He returned to Black Callerton early in 1801, where he held the responsible office of brakesman at the Dolly Pit. At this time he lodged in a small farmer's house, where the servant was a young woman named Fanny Henderson, whom he married about two years later. He began housekeeping at Willington Quay. As he had lately been offered the charge of the engine on Willington Ballast Hill, and had always been thrifty and industrious, he was able to keep a wife in modest comfort. At this time William Fairbairn, afterwards President of the British Association, was working as an engine apprentice at the Percy Main Colliery, and he and Stephenson were firm friends. At Willington Robert Stephenson was born on 16th October, 1803. George moved to Killingworth in 1805, and shortly after his arrival there his wife died, to his great grief.[1] When, a little later, he received an invitation from some gentleman concerned in large spinning works near Montrose, to superintend the working of one of Boulton and Watt's engines, he accepted the offer and made arrangements to leave Killingworth for a time.

He returned at the end of a year with plenty of money in his pocket, only to find that his aged father had met with a serious accident and had entirely lost the sight of both eyes. George was fortunately able to pay his debts, and the old man was supported by his son for many years.

In 1808, Stephenson, with two other brakesmen, took a small contract for braking the engines at West Moor Pit. About the same time he made his first step towards fame as engine doctor, by repairing a defect in an atmospheric engine which had puzzled all the engineers in the neighbourhood. In 1812 he was appointed enginewright at the Killingworth High Pit at a salary of £100 a year, and the increase in his income was a great help towards the education of his son Robert, who was sent to the village school kept by Rutter, the parish clerk. This teaching, however, was of the most elementary kind, and George, realizing what a drawback lack of learning was to him, determined that Robert should not suffer in the same way. His earnings were still comparatively small, he had to maintain his parents, and the cost of living was very high, but by working in his spare time at shoe mending, clock mending, and cutting out the pitmen's clothes he managed to make enough to send Robert to Bruce's school at Newcastle in 1815.

[1] Stephenson was married three times. His second wife, Elizabeth Hindmarsh, whom he married in 1820, was the daughter of a farmer at Black Callerton.

Stephenson's First Locomotive.—When the High Pit had been sunk, and the coal was ready for working, Stephenson erected his first winding engine to draw the coals out of the pit. He had now more time and opportunities for studying the locomotive. The Hedley and Blackett engine rattled regularly past the cottage at Wylam in which he was born. His mechanical genius and business instinct grasped at once the commercial and economical possibilities of steam locomotion.

Jonathan Foster seems to have been a very good friend to Stephenson, for George's visits to Wylam were regular, and he and Foster discussed over and over again the weak points of the engines that had been built up to that time, and the steps that might be taken to overcome them. It was in 1813 that he first brought the question before the lessees of the Killingworth Colliery. Speaking at the opening of the Newcastle and Darlington Railway, on 18th June, 1844, Stephenson said: " The first locomotive that I made was at Killingworth Colliery, and with Lord Ravensworth's money. Yes, Lord Ravensworth and partners were the first to entrust me, thirty-two years since, with money to make a locomotive engine. I said to my friends, there was no limit to the speed of such an engine, if the works could be made to stand." Not a year had passed since the construction of " Puffing Billy " by Hedley before Stephenson had approached his employers with a view to building a similar engine. This engine was called " Blücher ". Stephenson to some extent followed the plan of Blenkinsop's engine. Here is Smiles's description of it. " The boiler was cylindrical, of wrought iron, 8 ft. in length and 39 in. in diameter, with an internal flue 20 in. wide passing through it. The engine had two vertical cylinders of 8 in. diameter and 2 ft. stroke let into the boiler, working the propelling gear with crossheads and connecting rods. The power of the two cylinders was combined by means of spur wheels which communicated the motive power to the wheels supporting the engine on the rail, instead of, as in Blenkinsop's engine, to cog wheels which acted on the cogged rail independent of the four supporting wheels. The engine thus worked upon what is termed the second motion. The chimney was of wrought iron, round which was a chamber extending back to the feed pumps, for the purpose of heating the water previous to its injection into the boiler. The engine had no springs, and was mounted on a wooden frame, supported on four wheels. In order to neutralize as much as possible the jolts and shocks which such an engine would necessarily encounter from the obstacles and inequalities of the then very imperfect plateway, the water barrel which served for a tender was fixed to the end of a lever and weighted, the other end of the lever being connected with the frame of the locomotive carriage. By this means the weight of the two was more equally distributed, though the contrivance did not by any means compensate for the absence of springs." The wheels of the engine were all smooth. Not altogether satisfied with the results of Hedley's test carriage, Stephenson appears to have himself carried out similar experiments to test adhesion. After many alterations and delays—the designer was seriously handicapped by the

absence of good workmen and practical workshop experience—" Blücher " was completed.

On 25th July, 1814, it performed its trial run on the Killingworth plateway. On an ascending gradient (1 in 450) the engine showed itself capable of drawing a load of 30 tons at a speed of between 4 and 5 miles an hour. It is questionable whether " Blücher " showed any improvement upon the engines of Hedley and Blackett which were then running. Up to this time there had been no attempt to mount the engines upon springs, and the fact that the boiler carried the motion and had to take up all the shocks from the wheels as the engine jolted over the rough plateway, says a great deal for the soundness of the construction. In such circumstances the progress of an engine could be nothing else than a " succession of jolts ", and the wonder is that it ever survived more than the trial trip. We are told moreover that when the cost of working Stephenson's first locomotive and the cost of using horse power to draw the wagons had been compared for a year, the engine showed little or no economy.

Invention of the Blast Pipe.—One of the principal factors which contributed to the efficiency of the locomotive and its subsequent ascendancy over all other forms of traction was the invention of the blast pipe. Much controversy has raged round the question as to who is entitled to the chief credit for this notable improvement, and claims have been put forward on behalf of Trevithick, Hedley, Hackworth, and Stephenson. One of the most unsuccessful features of " Blücher " was the boiler, which was deficient in heating surface and of so primitive a nature that it was impossible to obtain anything but imperfect combustion of the fuel. For some reason Stephenson had not followed Hedley's design of the return flue but had adopted the single flue turned up at the end to form the chimney, as had been used in the Blenkinsop boiler. Stephenson had also made his chimney too large—it was, like the flue, 20 in. in diameter—and it had not then occurred to him that the exhaust steam from the cylinders, which was allowed to escape directly into the air, might be of value as an agent in obtaining better combustion. It will be remembered that Trevithick had terminated his exhaust-steam pipe in the chimney of his Pen-y-darran locomotive, whilst Hedley, after having passed the exhaust steam through the silencer, discharged it into the chimney.

Then came the discovery that by passing the exhaust steam through a narrow chimney, a partial vacuum would be created which would cause air to pass rapidly through the furnace and enable a much greater heat to be obtained from the same quantity of coal than had been obtained previously, and the blast pipe had arrived.

" Blücher " had other defects, e.g. the system of transmitting the motion to the wheels by means of gear wheels was obviously unsatisfactory, and in Stephenson's second locomotive (fig. 19) the entire abandonment of the cogs was a great feature in its favour. The engine had, like " Blücher ", two vertical cylinders, and the connecting rods were directly coupled to the driving wheels, while a cranked axle and a coupling rod between the frames enabled

all four wheels to be coupled. Stephenson adopted a very ingenious device to give complete flexibility to the piston rod and the connecting-rod cross-head, so as to minimize as far as possible the disastrous effects to the motion from the roughly laid track. The coupling rod joining the cranked axle was subsequently abandoned owing to the mechanical difficulty of forging such axles of sufficient strength, and Stephenson then adopted the simple expedient of coupling the wheels, for the purpose of adhesion, by means of cog wheels placed centrally on each axle with a chain rolling over them.

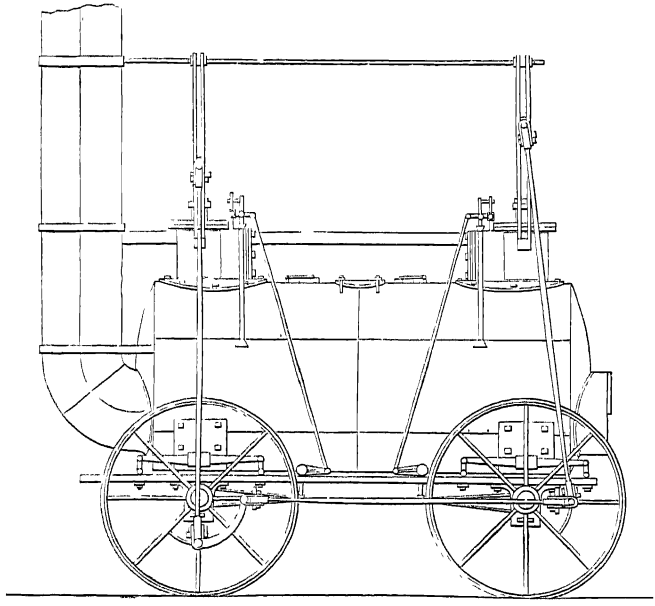


Fig. 19.—Stephenson's Killingworth Locomotive

Eventually this also was laid aside, and the wheels were coupled by means of rods on the outside.

Stephenson and Losh.—"Killingworth No. 2" was ungainly and crude, its speed was not more than 4 or 5 miles an hour, and we may take it that as a result of the imperfect workmanship which had been put into it the repair bill was a long one. But Stephenson's second locomotive established finally the superiority of steam over horse traction. The steam blast made all the difference in the coal consumption, and from that day forward the "Grand Allies" never repented the step they had taken in granting Stephenson the power and the funds that enabled him to prove to them that his ideas about the safety and efficiency of the "travelling engine" were not chimerical. The next engine was built in 1816, a patent being jointly taken out by Stephenson and Losh, an ironfounder of Newcastle. The same patent included an improvement in the rail known as the Stephenson half-lap or "scarfed" joint (fig. 20). The 1816 engine had several minor improvements, and the design included a very ingenious but

unsatisfactory device for taking the place of springs in absorbing the shocks from the road. The need of springs was seriously felt, but unfortunately the manufacture of steel springs of sufficient strength to bear a locomotive was beyond the accomplishments of the mechanics of the time. Stephenson's idea was to utilize the cushion of steam in the boiler in the place of springs, and his patent provided for four cylinders to be let into the bottom of the boiler, with their mouths open to the steam. Pistons with rods worked in the cylinders, the rods passing downwards and being fixed to the axle boxes, so that the thrust of each axle was absorbed by the piston with the head of

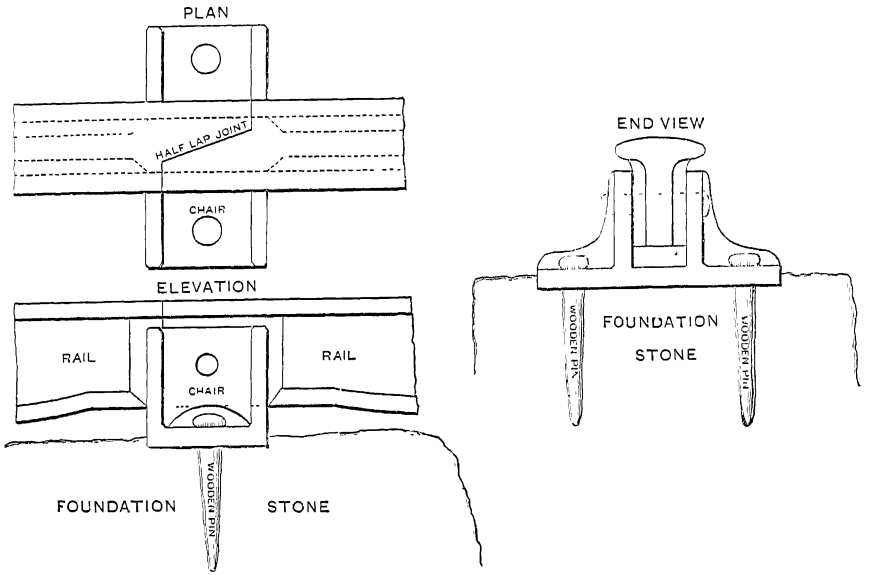


Fig 20 —Half-lap Rail Joint patented in 1816 by Stephenson and Losh

steam against it. In actual working, however, the floating pistons were not very successful.

Railways were now the rage in the coal districts of the North, but as yet the fame of the locomotive was purely local. In 1819, however, the proprietors of Hetton Colliery, in Durham, determined to discard their tramway for a locomotive railway, on the strength of the reports of the satisfactory working of these engines which had reached them from Killingworth and Wylam. Stephenson was asked to construct the Hetton railway, and under his direction a line about 2 miles long was laid from the colliery to a point on the Wear near Sunderland. The country was hilly, and Stephenson therefore decided that it would be wiser not to put his locomotives to too great a test whilst still in their rudimentary state. So the Hetton line was built with several self-acting inclines and two ropeway inclines, up which the wagons were drawn by means of a rope worked by a stationary engine. The line was opened in November, 1822, five of Stephenson's locomotives taking part in the ceremony. The speed at which the engines travelled was

about 4 miles an hour, and each dragged after it a train of seventeen wagons, equal to a load of 65 tons.

The Projection of the Stockton and Darlington Railway.—We come now to a period of railway history which is of the greatest importance—the period which saw the construction of the first public railway on which a locomotive was employed for haulage, and the first public railway to carry passengers. This was the Stockton and Darlington Railway, which was first projected in 1817. With its projection and construction two great names are inseparably associated—George Stephenson, engineer, and Edward Pease (fig. 21), financier, the man "who could see a hundred years ahead". Twice was a bill put forward which authorized the construction of a tramway from Wilton to Stockton. The opposition locally and in Parliament was tremendous, and a man without the indomitable courage and perseverance possessed by Mr. Pease would have abandoned the project as hopeless. In 1819 the third application was made to Parliament, this time with success; and two years later, in 1821, the Act was given the Royal Assent. The promoters did not entertain the idea of employing locomotives on the line. The public were to be free to use with horses, carriages, and cattle the tramway laid by the company, on payment of stated tolls and between fixed hours, in just the same manner that a turnpike road or a canal might be used. Hearing that the railway was to be built, Stephenson, accompanied by Nicholas Wood, the viewer, "to help him through", called one afternoon in 1821 on Mr. Pease in Darlington, and suggested that he might be allowed to undertake the construction of the line. Pease was pleased with his visitor, "there was such an honest, sensible look about him, and he seemed so modest and unpretending. He spoke in the strong Northumbrian dialect of his district, and described himself as 'only the enginewright from Killingworth, that's what he was'." The upshot of Stephenson's visit to Mr. Pease was that he prevailed upon the promoter to adopt a *railway*, instead of a *tramway* as was originally proposed, and, what was of greater importance, he made the shrewd capitalist promise to make a visit to Killingworth in

Fig 21.—Edward Pease

order to see the working of the locomotive. In the same year Stephenson re-surveyed the line, making it a few miles shorter and adopting more favourable gradients. The first rail of this epoch-making railway was laid with great ceremony at Stockton on 23rd May, 1822. In the following year, as a result of Mr. Pease's visit to Killingworth, a clause was inserted in the Act of Parliament, authorizing the employment of locomotives for the haulage of passengers as well as merchandize, and Stephenson was appointed the company's engineer at a salary of £300 a year. Stephenson did not lay down on the Stockton and Darlington line the " scarf " joint rails which he patented with Losh, but recommended the use of malleable rails of the fish-bellied type, weighing 28 lb. to the yard. As these malleable rails were, however, twice as dear as the cast-iron rails, it was eventually decided to use both.

The line was to be worked at points by stationary engines, largely by horses, and to a certain extent by locomotives, although there was much scepticism among the directors as to the success likely to attend the use of the travelling engines. However, three were ordered from Stephenson, and were built at the Forth Street works at Newcastle, which had been established in 1823, with the aid of Mr. Pease and some of his friends who had confidence in the genius and business ability of Mr. Stephenson. The railway was opened on 27th September, 1825, amid tremendous excitement and enthusiasm. The first train was drawn by " Locomotion ", engine No. 1 (fig. 22), and was composed of six wagons loaded with flour and coal (emblematic of the traffic from which the main revenue of the railway was expected to come), a coach for the directors and their friends, twenty-one wagons fitted up with seats for passengers, and another six wagon-loads of coal, making in all thirty-eight vehicles.

A start was made at Brusselton about 9 miles west of Darlington, and two hours were occupied in travelling to the Quaker Town although at one part a speed of 15 miles per hour was attained. Three unforeseen stoppages occurred, however, en route, two in connection with a faulty wagon and the third being due to a slight mishap to the engine. Half an hour was spent at Darlington, where the engine obtained a fresh supply of water, and then the train proceeded by way of Yarm to Stockton, and when approaching the latter place, at a point where road and rail run parallel to one another, the four-horse stage coach to Stockton came along the turnpike and for a few minutes coach and train ran side by side as if in rivalry. An immense crowd awaited the arrival of the train at Stockton, and the greatest enthusiasm was manifested at the conclusion of the first public railway journey in the world's history.

In Mr. Tomlinson's history of the North-Eastern Railway, mention is made of " a curious little girder bridge over the Gaunless—the first iron railway bridge in the world (fig. 23). It crossed the river at this time on four spans of twelve feet six inches each. Originally there were three, but after the flood of the 10th October, 1824, it was found necessary to add a fourth. Each girder was of wrought iron, and consisted of two segmental

arches, one curving upward and the other downward, their ends uniting, at the point of intersection, in a

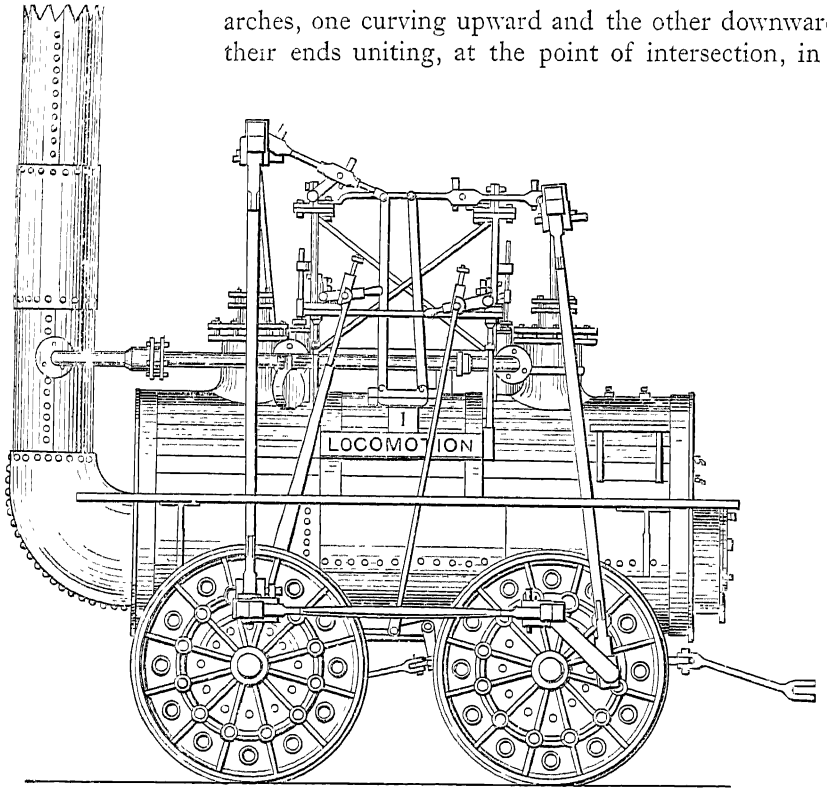


Fig. 22 —"Locomotion"

cast-iron boss: vertical tie-rods cast round both members were extended upward to form a support for the way-beams. The whole structure

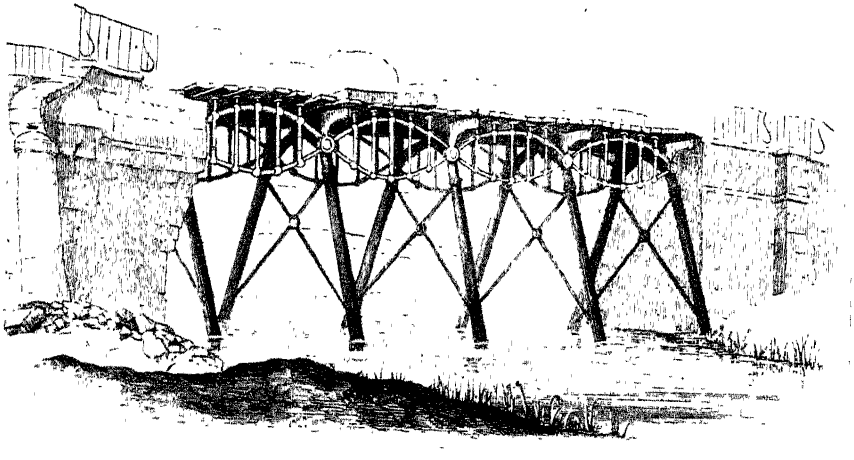
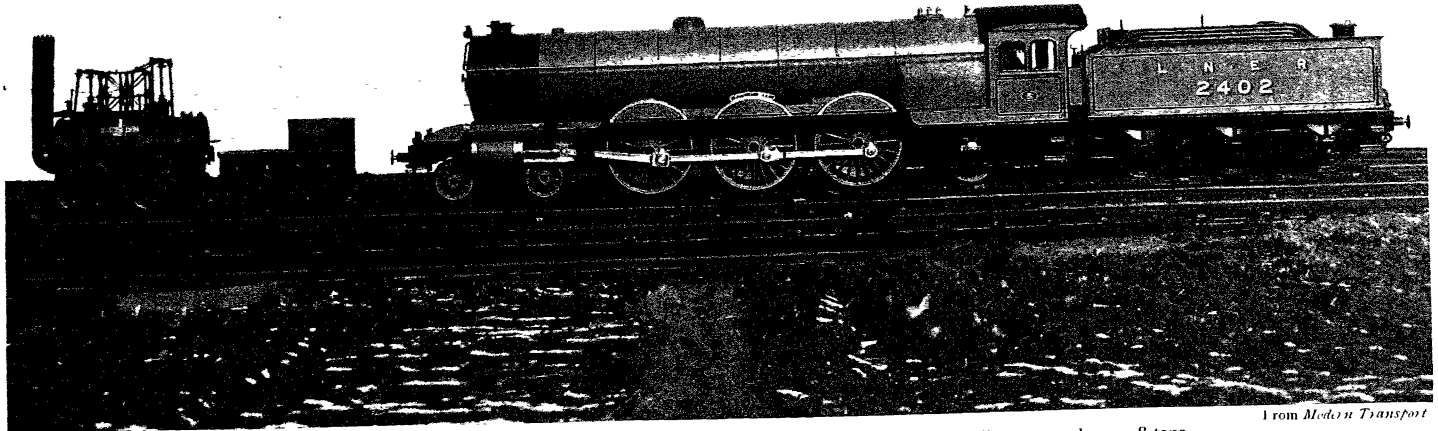


Fig. 23.—First Iron Railway Bridge in the World

rested on three piers, each of two cast-iron columns braced together" Two spans of this bridge are now in the railway museum at York.

"**Locomotion.**"—"Locomotion" is still carefully preserved at Darlington by the North-Eastern Railway Company, and a model of it was presented in 1896 by Sir David Dale to the Mechanical Collection of the South Kensington Museum. "Locomotion" ceased running in 1846. It is described in the catalogue of the museum as having two vertical cylinders 10 in. in diameter by 24 in. stroke, each driving, by means of side connecting rods, a pair of driving wheels 48 in. in diameter. These wheels are of cast iron, and are coupled together by external rods that maintain the driving crank pins of the front and rear wheels at right angles. The valves are of the short D type, driven by rocking shafts which both receive their motion from a single eccentric on the leading axle, one shaft being rocked directly and the other through a bell-crank lever. A platform runs along each side of the boiler, and from one of these the driver has control of the valve rods for disengaging and reversing. The tractive power of this engine per pound of mean pressure in the cylinders was 50 lb., but the boiler pressure used was only 25 lb. per square inch. The exhaust steam from both cylinders was conveyed by two blast pipes into the chimney. The feed water was forced into the boiler by a single feed pump 4 in. in diameter, driven by a lever from the front crosshead. The boiler is 10 ft. long by 4 ft. diameter, and has a single through flue 24 in. diameter and 10 ft. in length delivering into the chimney, which is 17·5 in. diameter; the heating surface is about 60 sq. ft. The wheel base of the engine is 5·33 ft. and the weight in working order is 6·5 tons. A single safety valve is provided, loaded by a weighted lever. The tender is built of timber, holds 15 cwt. of coal, and carries an iron tank containing 240 gall. of water. It also acts as a platform for the fireman, and is carried on four cast-iron wheels 30 in. in diameter. "Locomotion" is estimated to have been of about 20 h.p., and had a speed of 8 miles per hour. The total weight of engine and tender in working order was 9 tons. An interesting comparison between "Locomotion" and the "City of York", a recent engine of the "Pacific" type weighing 148 tons, is shown in fig. 24.

The Working of the Line.—Needless to say, the most sanguine anticipations of the promoters of the first public railway were more than realized. The traffic in coal, from which the main revenue was expected to come, increased at such an alarming rate that it was speedily found that horses were quite unequal to cope with it, and the locomotive's utility was finally established in the minds of Mr. Pease and his co-directors. The carriage of passengers was not thought of at the time when the bill was promoted, although a clause giving power to the public to travel on the line was subsequently inserted. So few persons, however, were in the habit of travelling between the places served by the railway that profits from passenger traffic were outside the calculations of the promoters. The company, nevertheless, directed Stephenson to construct a coach suitable for the conveyance of passengers, and the "Experiment", as this coach was called, was the rude forefather of the race of sumptuously appointed



From *Modern Transport*

Fig 24.—" Locomotion " alongside the " City of York ", a recent engine of the " Pacific " type, weighing 148 tons

vehicles in which we are to-day moved across the face of the country at speeds which in 1825 were known only to mythology. The " Experiment " was a great success, and was shortly followed by other coaches, which were placed on the line by private coachmasters paying tolls to the railway company. These coaches were drawn by horses and covered the 12 miles between Darlington and Stockton in about two hours, the fare for the journey being a shilling. One of the early coaches, although probably not a horse-drawn vehicle, is preserved in the L. & N. E. Railway Museum at York. It consists of one first- and two second-class compartments, the latter being cushionless and with windows only in the doors. The vehicle is painted teak colour and is shown in fig. 25.

Another type of vehicle also preserved in the same museum is the

Fig. 25.—Old Stockton and Darlington Railway Carriage

Dandy Wagon introduced in 1828. This is a four-wheeled light truck raised a foot or two above the ground, which was attached to the coal trains on sections where horse haulage was required. The horse hauled the small chaldron wagons up the inclines, and then when the train reached the summit the horse was unhitched, jumped into the Dandy Wagon, and rode therein as the train descended the incline by the force of its own gravity.

In the course of a couple of years the traffic, as we have already said, became so great that horses were found to be quite unable to deal with the increasing loads, and in 1827 the company found it necessary to appoint a locomotive engineer to look after the growing engine stock. Timothy Hackworth was the man chosen for this post, and he fulfilled it ably and profitably; so profitably, indeed, that on one occasion, it is said, a director of the company at a Board Meeting remarked: " All we want is plenty of Timothy's locomotives ". Of Hackworth's great engineering ability there can be no doubt, and, though he was a valuable acquisition to the

Stockton and Darlington Railway, one cannot help regretting now that he was not actively engaged in helping Stephenson to combat the antagonism which the promoters of the early railways had to meet, and which cost them vast sums of money to fight.

As for Stephenson, he had now found a wider field for the exercise of his genius. The success of the railways had been noised abroad; the talk of the locomotive was no longer confined to the limits of a few north-country towns. On the Stockton and Darlington Railway he had laid the foundation stone of the vast railway system which, as he himself had said, would "supersede almost all other methods of conveyance"; which has, indeed, provided "great highways for the king and all his subjects".

CHAPTER IV

The Liverpool and Manchester Railway

In the year in which the Act authorizing the Stockton and Darlington Railway was passed (1821), merchants in the great industrial centres of South Lancashire—at that time the most prosperous district of the United Kingdom—were seeking for greater facilities for the transport of their goods from the seaboard to the inland towns. Mr. Joseph Sandars, of Liverpool, and Mr. William James, of West Bromwich, were prominent among the body of men who, voicing the general determination to obtain better means of transport than those offered by congested canals and bad roads, set to work to formulate a scheme for constructing a tramway between Liverpool and Manchester. The result was that in 1821, James, who was a land agent and engineer of experience, was commissioned to survey a route for the proposed line. This trial survey was, authorities tell us, conducted only with the greatest difficulty. A section through the railway is shown in fig. 26. The inhabitants of the district, already filled with horror and loathing, bred of ignorance, of the new-fangled notions which had recently been introduced to them, used the most violent methods to frustrate the operations of the surveying party. Assault of person was resorted to when curses and execrations failed to have the desired effect, and the instruments—theodolites were then more costly pieces of apparatus than they are now—were smashed to atoms. In the meantime Mr. James determined to see what the Killingworth locomotives were like, and whether they could be utilized with advantage on the proposed tramway. Mr. James was a thoughtful and far-seeing man. "Here", said he, when he had inspected the engine, "is an engine that will, before long, effect a complete revolution in society."

On two other occasions Losh and Stephenson met James at Killingworth, and the capabilities of the engine were thoroughly tested. James

had no doubt whatever of the success which would attend the use of the locomotive on the railway, and he spared no pains to establish its merits in the minds of the promoters. As might be expected from what we have already said, the directors were hard to persuade. Nothing was definitely settled until early in 1825—some six or seven months before the Stockton and Darlington Railway was opened—when a party of gentlemen financially interested in the Liverpool and Manchester project went to Killingworth and had all their doubts and fears removed when they saw the locomotive running away with a train of about 50 tons, at a speed of about 7 or 8 miles an hour.

Mr. James's survey of the proposed line was very imperfect. The opposition of the landowners and farmers had rendered the work very difficult

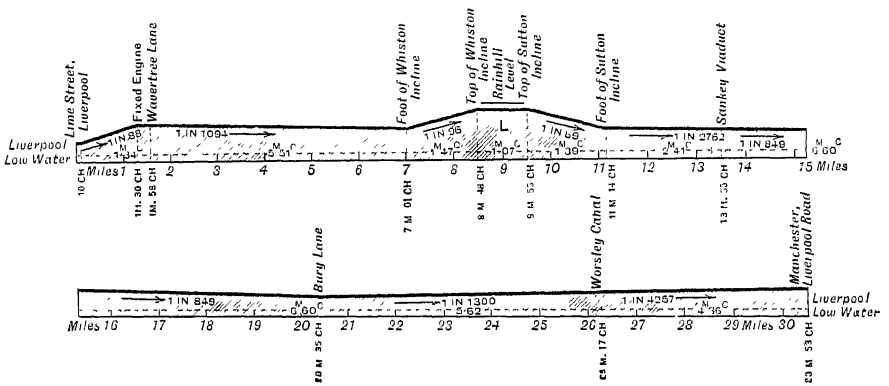


Fig 26 —Section through the Liverpool and Manchester Railway

indeed, and in 1822 a second one was attempted. In the following year, however, James, owing to illness and debt, had to resign the position of engineer, and the promoters were obliged to call to their aid someone to fill his place. They turned naturally to the greatest authority on the subject of railways and travelling engines, George Stephenson, and, on the earnest recommendation of Mr. Sandars, Stephenson was unanimously appointed.

Chat Moss.—One of the greatest difficulties of the survey was the taking of the levels on Chat Moss. Everyone has heard of Chat Moss and of Stephenson's tremendous achievement in performing what the highest engineering authorities of his day regarded as " impossible ", constructing a line of railway over this bog; but few people, especially those who have never seen one, have an adequate conception of what an awkward thing a big bog is to deal with. Chat Moss is some miles west of Manchester and is the largest bog in England, being nearly 12 square miles in area. It varied in depth from 10 to 35 feet, and the bog moss of which it was composed was so spongy that it swelled considerably after heavy rain. It has now been reclaimed and is under cultivation, indeed there are two stations upon it. It might almost be said that it was famous before Stephenson's connection with it, for from 1793 to 1800 it was the scene of the first practical attempt

to reclaim large tracts of bogland in order to fit them for agricultural development.

Any object that was too heavy to float on water, when placed upon this bog, became immediately submerged. Cattle had been lost in it, and it was considered unsafe to venture near its edges. One can imagine, then, the difficulties and dangers that befell the members of the surveying party of the Liverpool and Manchester Railway when they ventured upon this part of their task. On one occasion, indeed, Mr. James found himself sinking, and reached the dry edge of the moss only with great difficulty. Several years later, when the line was actually under construction, one of the resident engineers, who was about to take up his duties, failed to provide himself with pattens, or wooden boards fixed to the boots, which workmen on the moss always wore, when first he ventured on to the bog. The result was, of course, that a slight deviation from the temporary road, that had been formed with boards, brought him up to his waist in the squashy morass, from which he was only extricated with great difficulty.

The Railway Prospectus.—To return to 1824, the promoters of the railway were pushing forward their plans, in spite of opposition, with considerable speed. The first prospectus of the Liverpool and Manchester Railway was issued in October. It set forth, as among the advantages with which it claimed public attention, that goods could be conveyed between the towns in five or six hours, as against two days or longer by the canal; the charges for the carriage were to be substantially reduced; and it was held out as being not improbable that conveyance of passengers might add to the revenue of the company. The cost of building the line was estimated at £400,000.

Up to the moment of the issue of the prospectus the canal monopolists had seriously regarded the project as one which was bound to fail. It must have been a very nasty blow to them to find that there was quite a rush for shares in the new company, and that the merchants waxed enthusiastic about the new age of prosperity which they were soon to see. There remained nothing for it but to resist the measure tooth and nail, and when, therefore, it was known that the railway people intended to apply for an act authorizing them to construct the line during the parliamentary session of 1825, the campaign began in earnest. Pamphlets casting ridicule upon the railway scheme were scattered broadcast over the country; newspapers were hired to revile the locomotive as a public danger and terror; and when at last Stephenson's survey was complete, and the plans were ready for Parliament, the promoters knew that the fight was to the death.

The most extraordinary methods were adopted by the opponents to calumniate the locomotive. It was solemnly averred that if travelling steam engines were allowed to run over the country at large, cattle and horses would be so frightened as to become unmanageable, while it was not unlikely that horses would disappear from the country owing to disuse, and that forage merchants must inevitably be ruined. The sparks from the engines would devastate the countryside; the poisonous fumes would kill

vegetation, and birds would be either killed outright or else driven from the country. People were asked what would be the consequences to the public health and morals. Would not children be terrified, and the nerves of women be shattered? The bursting of the boilers would kill thousands, and there was, to wind up with, always the consolation that if these diabolical engines could manage to move at all (which was doubtful), the public would never trust itself to travel in carriages drawn by them. These diatribes had the desired effect. The masses were in 1825 more credulous than they are to-day, and they lent ready ears to the invective poured upon the railway and the locomotive by the canal and coach companies, and the others who sought to feather their own nests.

At one of the meetings between the promoters and their parliamentary counsel, Stephenson expressed his confidence in his ability to make the locomotive travel at the rate of 20 miles an hour " or even more ". He was frankly told, however, that if he did not moderate his views, and bring the engine within a reasonable speed, he would " inevitably damn the whole thing and be himself regarded as a maniac, fit only for Bedlam ".[1]

Although he had proved the practical success of his locomotives at Killingworth, Stephenson found himself in a sad minority with regard to the rate at which he believed they could travel. No engineer of note could range himself on the self-taught mechanic's side without courting the serious displeasure of his patrons and his profession. It is true that one or two men of science and engineering ability expressed some faith in the project of a railway between Liverpool and Manchester, but the " big men " of the day, as a body, seriously discountenanced the scheme. Even the *Quarterly Review*, although it supported the project, said: " What can be more palpably absurd and ridiculous than the prospect held out of locomotives travelling twice as fast as stage-coaches? We trust that Parliament will, in all railways it may sanction, limit the speed to 8 or 9 miles an hour."

The Bill in Parliament.—On 21st March, 1825, the Bill for the construction of the Liverpool and Manchester Railway went before the Committee of the House of Commons. The opponents of the Bill had gathered together a formidable array of counsel. For exactly a month the Committee was concerned with hearing the case for the promoters, as regards the total inadequacy of the existing means of transport, and the immediate necessity for the railway. They had, indeed, little difficulty in proving that the canals were quite incapable of dealing with the business placed in their hands, and an overwhelming mass of evidence was brought forward to show the stagnation that existed, and the losses to the traders that ensued. The next step was the hearing of the engineering evidence in support of the Bill. On 25th April George Stephenson went into the witness box. He had been well coached as to what he had to expect; how the opposition counsel would direct their attack upon his evidence; and how important it was that he should " moderate his views " with regard

[1] *George and Robert Stephenson*, by Samuel Smiles.

to the speed at which his engines could travel. His position must have been a very trying one. Many years later it is stated that Stephenson said, after having heard an eloquent attorney, Sir William Follett, beat Dr. Buckland in a friendly argument: "Of all the powers above and under the earth there seems to me to be no power so great as the gift of the gab." Stephenson did not possess the gift of the gab. He was a bad talker and a bad writer, and the untutored engineer—"the inarticulate genius", as he has been well called—was no match for the legal eloquence and resource with which he was confronted. Counsel badgered him and bothered him, worried him into saying one thing and then made him contradict it. Sneers, interruptions, ridicule, were cast upon all he said. He was openly called an impostor, a financial charlatan, and a lunatic, while a member of the Committee, when the witness avowed that he could make the locomotive travel at 10 or 12 miles an hour, broadly hinted that the man "must be labouring under a delusion" They examined him upon all the details of his career. So long as they kept to the locomotive his knowledge was a match for the expert ignorance of his legal tormentors; but when they started to examine the engineer upon the task of constructing the railway itself, they were soon able to show that not only his ideas of earthwork and masonry construction, but also the plans of the works which had been deposited, were seriously at fault. As a matter of fact they were far from perfect. Stephenson himself was at that time not sure of the best route, and he made the fatal mistake, when in the witness box, of not sticking definitely to the original plans. But his idea of a road across Chat Moss gave the opponents their most powerful weapon. "Who but Mr. Stephenson", asked counsel, "would have thought of entering into Chat Moss and carrying it out almost like wet dung? It is ignorance almost inconceivable. It is perfect madness in a person called upon to speak upon a scientific subject to propose such a plan. Every part of this scheme shows that this man has applied himself to a subject of which he has no knowledge, and to which he has no science to apply." Reverting to the locomotive engine, and the speed at which its supporters avowed that it could travel, the same gentleman said: "Mr. Adams (one of the counsel for the bill) does not now go faster than five miles an hour. The learned Sergeant says he would like to have seven, but he would be content to go six. I will show he cannot go six; and for any practical purposes I will show that I can keep up with him by the canal. Locomotive engines are liable to be operated upon by the weather. You are told they are affected by rain, and an attempt has been made to cover them. But the wind will affect them. Any gale of wind that will affect the traffic on the Mersey would render it impossible to set off a locomotive engine either by poking the fire or keeping up the steam till the boiler was ready to burst." Again, another authority characterized Mr. Stephenson's plan as "the most absurd scheme that ever entered into the head of man to conceive. I say he never had a plan—I believe he never had one—I do not believe he is capable of making one. The ignorance of this so-called engineer is appalling. He proposes to cut impossible ditches by the side of an impossible railway upon Chat Moss."

An eminent engineer, Mr. Francis Giles, was also called upon to show the " utter futility " of attempting to build a railway on Chat Moss. Curiously enough, Mr. Giles afterwards became a railway engineer of some note himself. " No engineer in his senses," he said, " would go through Chat Moss if he wanted to make a railroad from Liverpool to Manchester. In my opinion a railway certainly cannot be safely made over Chat Moss without going to the bottom of the bog."

Vignoles' Survey.—The result of this tirade of abuse was that the clauses empowering the company to acquire land and to build the railway were thrown out by the Committee. The Bill was thereupon withdrawn. The fight had lasted two months, and had cost the company a very large sum of money. If the promoters were disappointed, so also were the people of the towns to be served by the railway, and George Stephenson suffered more keenly than anybody. However, it was decided that the scheme could not be abandoned, and that another application must be made to Parliament.

Stephenson had been so badly treated by the opposing counsel, and by the Committee itself, that it was thought better not to associate his name with the new survey. The directors therefore called to their assistance Messrs. George and John Rennie, engineers of great repute. The Rennies are now better known for having carried out several of the great works contemplated by their father, John Rennie the Great, which were not proceeded with until after his death; such works including Southwark and London Bridges, and several of the more important docks on the Thames. George and John Rennie entered into partnership on their father's death, and built for themselves a great business and reputation. In choosing them the directors of the Liverpool and Manchester Railway chose the highest engineering talent of 1825. Charles Vignoles was, on the recommendation of the engineers, appointed to undertake the new survey. According to Pendleton, Vignoles went down from London to Liverpool in July, 1825, by coach, the journey occupying twenty-four hours, and the fare costing him four guineas. He spent his first week in examining the plans of the " old line " as well as the ground over which it was to pass, and in suggesting various " improvements".

Vignoles' line differed from Stephenson's inasmuch as it gave a wider berth to the lands of Lord Derby, one of the most vigorous opponents of the railway, and entered Liverpool by a tunnel under Edge Hill, thus avoiding the necessity of crossing the city's streets. When the Bill went the second time before Parliament the criticism was as severe as ever, but the promoters were better able to meet it. " Who," asked Sir Isaac Coffin, to the merriment of the House, " would consent to see widows' premises invaded by locomotives, and a railway under everybody's parlour windows?" Notwithstanding so powerful an argument against it, the Bill was passed by the House at the third reading by a majority of two to one, and it passed still more easily through the Lords.

Construction of the Line on Chat Moss.—The construction of the railway was commenced immediately the powers were obtained. The works to be undertaken were of unparalleled magnitude, and the directors were

desirous of obtaining the best engineering superintendence. The brothers Rennie had their hands full, and could only exercise a general superintendence over the work, George Rennie stipulating that he should make six visits to the line each year, and report on the progress made. This arrangement, however, the directors could not agree to, as the responsibility of building the line demanded the sole efforts and concentration of one engineer. They considered Mr. Stephenson's claims for the work, and he was appointed the company's chief engineer at a salary of £1000 a year.

Of all the great tasks with which Stephenson then found himself con-

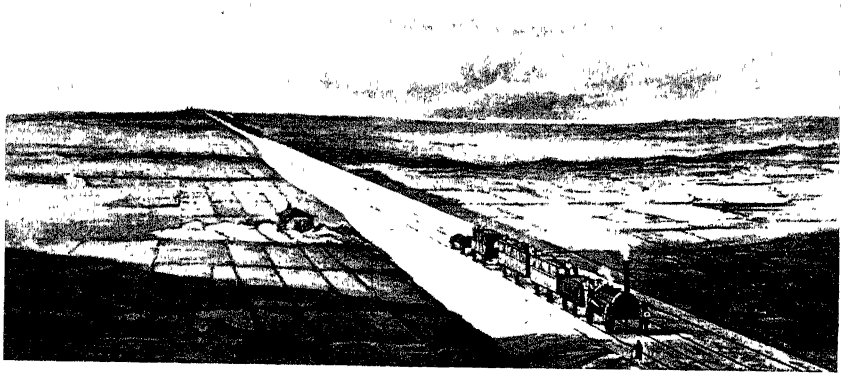


Fig. 27.—View of Railway across Chat Moss (kindly lent by the L. M. & S. Railway Company)

fronted, none, he knew, would so hardly try the patience of himself and his directors as the construction of the line across Chat Moss; and it was to this work that he first applied himself on his appointment. The accomplishment of this work—a work which had been generally pronounced "impossible" by the highest authorities of the country—was one which deserves to rank with the improvement of the locomotive as George Stephenson's greatest achievement.

The engineering faculty of Stephenson's day could consider it only possible to build a tremendous embankment of solid material, resting on the bottom of the bog, to carry the railway, the spongy mass forming the bog having been first entirely removed. The cost of such an embankment would have been prohibitive. Francis Giles, in the evidence which he gave

against the Bill before the Parliamentary Committee, estimated the cost of building an embankment over Chat Moss at £270,000. As a matter of fact the total cost incurred by Stephenson in forming the line over the Moss was £28,000; and it turned out to be one of the cheapest works on the railway. This part of the line took three and a half years to construct. It was commenced in July, 1826, and finished in December, 1829; but had Giles had charge of the work, it would probably have occupied twice that time. Stephenson did not build a solid embankment over Chat Moss; he had an idea better than that. He constructed what was in effect an enormous raft, on which his railway floated.[1] Hurdles interwoven with heather and bracken were laid upon the moss. On the "raft" thus formed were laid the sleepers, rails, and ballast; and thus, hurdle by hurdle, the floating line across Chat Moss slowly grew. As the moss was more liquid in some places than in others, and as some sort of drainage was absolutely necessary, the engineer set to work to provide it. Open ditches cut by the side of the line filled up immediately; so Stephenson ordered a vast number of empty tar barrels, and these were laid in the centre of the line like a great wooden sewer, which was doubtless preserved from rapid decay by the bitumen of the bog. A primitive system of drainage, it is true, but, as it proved, a highly satisfactory one. A very great difficulty was encountered at the Manchester end, where it was necessary to build an embankment upon the edge of the moss to join up, as it were, the rigid and flexible portions of the line. The "dirt" that was brought up to form this embankment disappeared from sight as soon as it was tipped into the bog. Turf, heather, and brushwood were used to help to support the bank, but apparently without avail, for the "filling in" process went on for weeks without any outward and visible sign. At length, however, the sunken turf gradually came into sight, and the embankment slowly grew. Stephenson afterwards spoke of the difficulties of the work in these terms. "After working for weeks and weeks, in filling in materials to form the road, there did not appear to be the least sign of our being able to raise the solid embankment a single inch. In short, we went on filling in without the slightest apparent effect. Even my assistants began to feel uneasy, and to doubt the success of the scheme. The directors, too, spoke of it as a hopeless task; and at length they became seriously alarmed, so much so, indeed, that a board meeting was held on Chat Moss to decide whether I should proceed any further. They had previously taken the opinion of other engineers, who reported unfavourably. There was no help for it, however, but to go on. An immense outlay had been incurred, and great loss would have been occasioned had the scheme been then abandoned and the line taken by another route. So the directors were compelled

[1] It is almost inconceivable that the engineers who gave evidence against the Bill could have really regarded Stephenson's plan as "impossible", for there existed in London at that time many houses, built before the nineteenth century, which were actually floating on the marshy land bordering the Thames. Such houses exist at present, and were constructed on rafts of timber on which the foundations were laid. The fact that newspapers and high authorities echoed the opinion in good faith seems to indicate profound ignorance of constructive science in 1825.

to allow me to proceed with my plans, of the ultimate success of which I myself never for one moment doubted." Other important works which had to be constructed on the Liverpool and Manchester Railway were a tunnel at the Liverpool end, a deep cutting at Olive Mount, and a viaduct across the Sankey valley (fig. 28). We have called these works "important". They would, indeed, be worthy of that adjective if they formed works on a line of railway put under construction to-day; but in 1826 these operations could rightly be regarded as stupendous.

That bridges and cuttings such as those at Sankey and Olive Mount

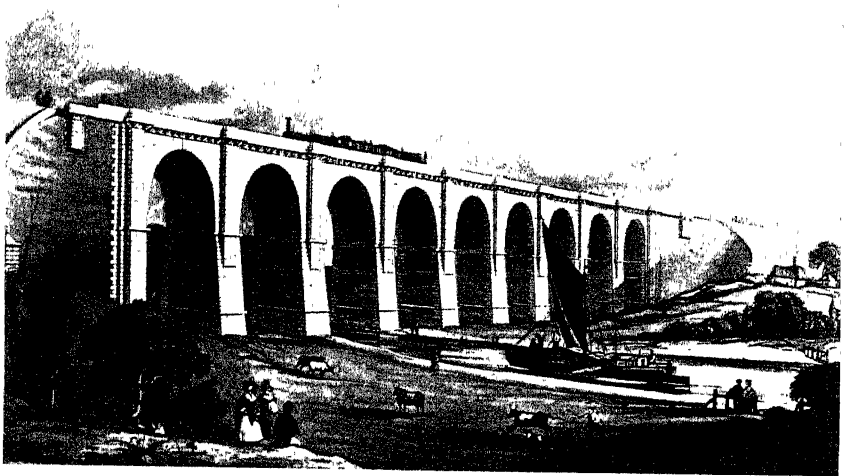


Fig. 28.—Sankey Valley Viaduct (kindly lent by the L. M. & S. Railway Company)

should have been successfully undertaken at moderate cost affords a convincing proof of George Stephenson's ability to adapt his genius to whatever task he set himself.

Early Engineering Works.—Many persons who are not engineers frequently run away with the impression that engineering works of any magnitude were unknown prior to the advent of the railway. Apart from the works which the Romans left in this country, and the still greater monuments that testify to the engineering ability of Oriental nations of the past, masonry works of considerable extent had been built for foreign canals even before Brindley engineered the Bridgewater and Grand Trunk canals. Brindley's masterpiece, the Barton Aqueduct, was constructed in 1770, and was the first notable aqueduct constructed in this country. This was followed, in the closing years of the eighteenth century, by Telford's wonderful Chirk Aqueduct, which carries the Ellesmere Canal across the Ceriog

valley, 700 ft. wide, on ten arches, at an altitude of 70 ft.; and the still larger and more imposing aqueduct on the same canal, that at Pont-Cysylltau. Of this stupendous work of masonry Sir Walter Scott said that it was " the most impressive work of art he had ever seen ". The aqueduct consists of an iron trough, over 1000 ft. in length, carried on nineteen arches, the piers being 120 ft. high. The aqueduct was opened in 1805. The first iron bridge (see fig. 23, p. 40) was constructed near Coalbrookdale in 1779 at a place which has since become known to " Bradshaw " as Ironbridge. Telford's masterpiece was, of course, the great suspension bridge over the Menai Strait, on the Holyhead road. This beautiful bridge has a clear span between the pyramids of 580 ft. The work of building the bridge was commenced in 1820, and it was opened in 1826. The total weight of iron in this bridge was 2187 tons and the cost of construction was £120,000. The Conway suspension bridge, one of the works on the same road, also designed by Telford, was completed in the year of the opening of the Menai Bridge. From the engineering point of view it is a far less important structure than the Menai Bridge, but it afforded good scope for Telford's powers as an architect. We have said enough to show that, with such engineers as Brindley, Telford, and the Rennies, bridge-building was no science new to the country when the railway builder made his appearance. At the same time, the railway engineer, who adapted to his own needs known principles of masonry construction, must take the credit for the fact that the United Kingdom possesses the finest collection of imposing bridges of iron and masonry in the world.

Other Works on the Liverpool and Manchester Railway.—Olive Mount (fig. 29) cutting is 2 miles long. In some places it is over 70 ft. deep. The work of excavating 480,000 c. yd. of the red sandstone through which it was cut was one which, though it has since been surpassed, was at the time thought to be very formidable. Next to the building of the railway over Chat Moss, the driving of the tunnel under Liverpool was the most awkward work entailed in the construction of the railway. This tunnel is $1\frac{1}{4}$ mile in length, and was driven in water-bearing shale and sand. Several times the men were drowned out, but Stephenson's mining experience stood him in good stead, and the work was eventually completed at a cost not greatly in excess of the estimate.

One of the most remarkable things in connection with George Stephenson's genius, and one frequently overlooked, was the readiness with which he turned his attention, at a time when these great works were causing him constant anxiety, to matters of detail which a modern engineer would leave to be thought out by his assistants. Stephenson, however, had no assistants worthy to be so called; railway work was a new science, and the thousand details which are now spread over a great number of departments had to be settled by his own mind and hand. Thus the permanent way, points and crossings, turntables and water towers, as well as the rolling stock for the new line, had to be designed and constructed. And with the exception of the Hetton, Killingworth, and Stockton and Darlington lines, and the

earlier tramways, which were of much lighter construction, there was no precedent to guide him. Then there were the drawings and plans of the works contemplated and in progress, which had to be prepared with the engineer's own hands. Like many another self-taught engineer, he was

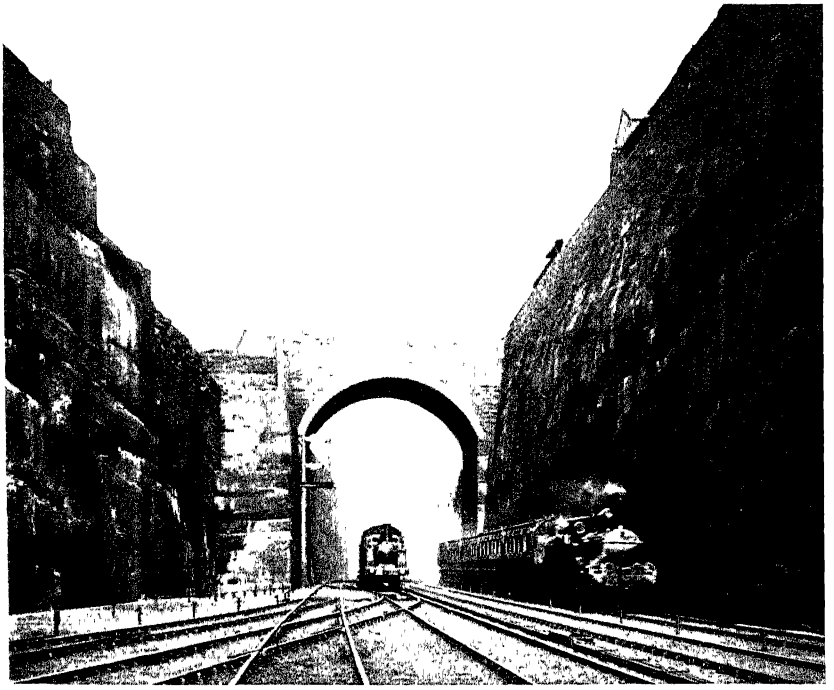


Fig. 29.—Olive Mount Cutting (kindly lent by the L. M. & S Railway Company)

able to dispense with working drawings to a degree which would flabbergast many an engineer who had qualified on paper. In his spare moments—or rather in the rare intervals when he was not actually engaged in superintending the works which were in construction all along the line—he lent a helping hand in the projecting and constructing of other lines; while the improvement of the locomotive was one of the objects ever nearest to his heart.

CHAPTER V

The Triumph of the Locomotive

Stephenson had still need to use all his energies to champion the locomotive. The opposition was so strong that about the time that the Liverpool and Manchester line was nearing completion the locomotive was on the

verge of falling back into the state of oblivion from which it had been rescued. The directors of the company were themselves undecided whether it would be more economical to work the traffic by means of locomotives or by fixed engines. Fixed engines had many advocates, the locomotive very few. However, at Stephenson's earnest request they authorized the construction of one of his locomotives for trial purposes. This was delivered in 1829, and was used with great advantage in removing the dirt excavated from the cuttings. However, the directors were unable to make up their minds what tractive power to employ. Some were in favour of horse traction, and plans for working the trains poured in upon them from all parts. Some proposed hydrogen, some carbonic acid gas, and others advocated atmospheric pressure. So persistent, however, was Stephenson in urging upon the directors the advantages of the steam locomotive, that they determined to offer a prize of £500 for the engine which would perform certain tasks under specified conditions in the most satisfactory manner.

The Rainhill Trials.—The trials of the locomotives which competed were held on a stretch of level line $1\frac{3}{4}$ mile long, at Rainhill, in October, 1829. The competing engines were required to make ten double trips over this stretch of line at full speed, which were to represent a journey from Manchester to Liverpool. An interval was allowed for taking in fresh water and fuel, and then a second series of ten double trips was made. The principal conditions of the competition were as follows:

1. The engine must consume its own smoke.
2. The engine, if of 6 tons weight, must be able to draw after it regularly, day by day, 20 tons weight at a speed of 10 miles an hour; the boiler pressure not to exceed 50 lb. to the square inch.
3. The engine and boiler must be supported on springs.
4. The engine and boiler must not weigh more than 6 tons; and if it exceed $4\frac{1}{2}$ tons in weight, it must be carried on six wheels.
5. The cost of the engine must not exceed £550.

Four locomotives were built and entered for the trial. They were "The Rocket", designed by George Stephenson, and built by Robert Stephenson at his works at Newcastle; Timothy Hackworth's "Sanspareil"; Braithwaite and Ericsson's "Novelty"; and Burstall's "Perseverance". The 'Perseverance" was, however, very soon withdrawn. It was a dismal failure in every respect, and it could never have accomplished anything on account of the inadequate heating surface of the vertical boiler with which it was fitted. It was found to be unable to draw a load, and could not propel itself at a greater speed than 5 or 6 miles an hour. The popular favourite before the trial was the "Novelty". Unfortunately no complete and authentic drawing of this engine is in existence. The engine itself was probably destroyed soon after the trial. The illustration of the "Novelty" which we give (fig. 30) is from the drawing prepared by the authorities of the Victoria and Albert Museum. The engine had a combined vertical and horizontal boiler, the fire box being in the vertical portion (fig. 31). The

eccentricity of the design was certainly worthy of the man who built the iron cupola vessel *Montor*. The gases in the " Novelty's " boiler traversed the horizontal part three times. Bellows worked by the engine forced the fire, which was fed by shooting the coke down a central flue in the vertical boiler. The engine had two vertical cylinders, 6 in. in diameter, which,

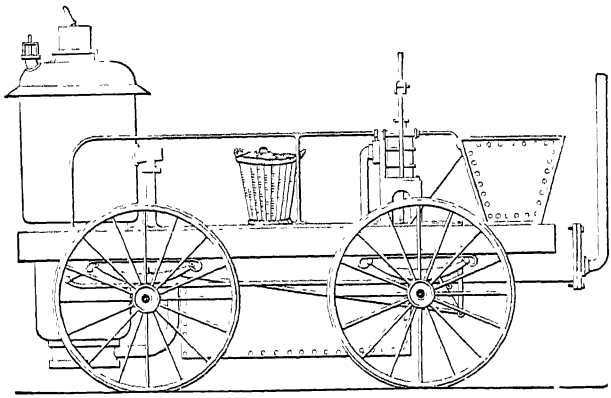


Fig 30.—The " Novelty "

by means of long connecting rods, drove the single driving wheels, which were on a cranked axle. The engine had 1·8 sq. ft. of grate area, and 42 sq. ft. of heating surface. The engine carried its coal in baskets, and its water supply in a tank on the engine, requiring no tender, and being virtually the first tank engine. The " Novelty " weighed nearly 4 tons in working order.

The " Sanspareil " (fig. 32) is still carefully preserved, together with the

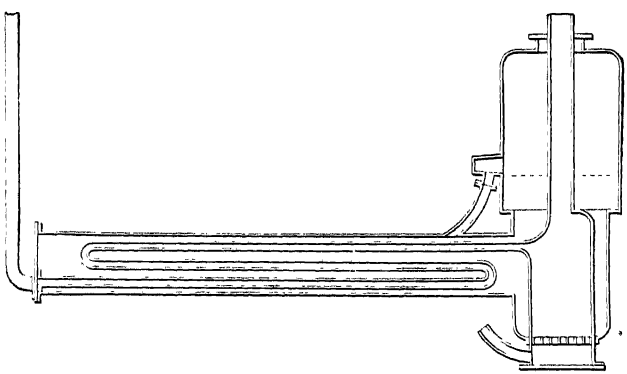


Fig. 31.—Boiler of " Novelty "

" Rocket ", at South Kensington. In many respects the " Sanspareil " was an admirable and well-built machine, and in spite of its obvious faults it has served to enhance our opinion of Hackworth's capabilities as a locomotive engineer. In 1837 the " Sanspareil's " present cylinders, which are larger than the original ones, were substituted, and the wood-spoked wheels were replaced by wheels of cast iron. In 1844 it was removed to Coppull

Colliery, near Chorley, where one axle and pair of wheels were removed, and toothed gearing fitted to the other axle, in order to give motion to pumping and winding machinery. It worked in this way most satisfactorily till 1863, when, on the mine being exhausted, the engine was re-erected as a locomotive and presented to the museum. The boiler

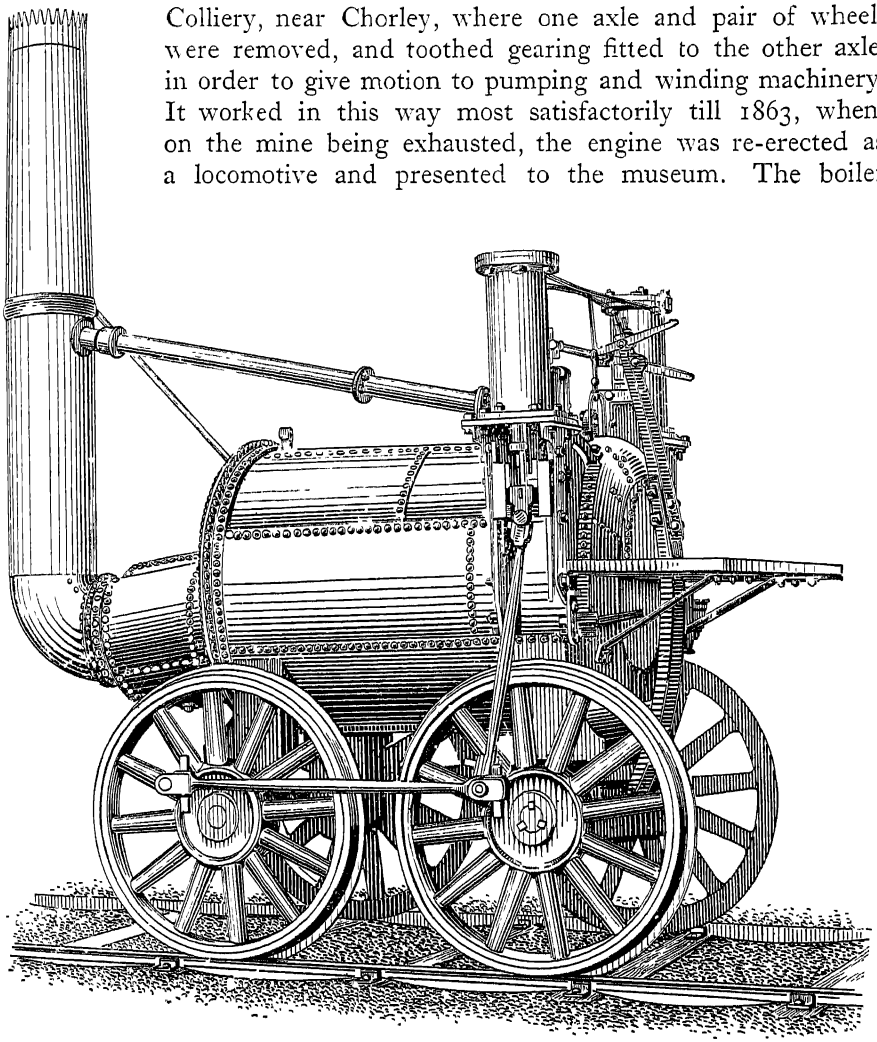


Fig. 32.—The " Sansparell "

(fig. 33) has a cylindrical shell, with one end flat and the other dished, and an internal return flue which projects beyond the boiler on the fire-grate side and is enclosed in a water jacket, thus considerably increasing the heating surface. There are two vertical cylinders acting directly downwards on the crank pins in the driving wheels, which are, however, connected by coupling rods to the leading wheels, and the

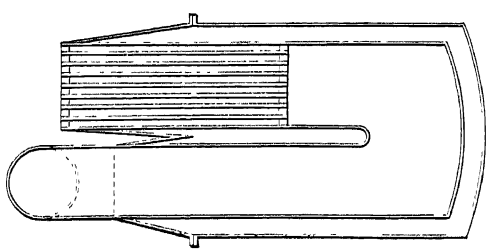


Fig. 33 —Boiler of " Sansparell "

engine is without springs. The valves are worked by two loose eccentrics on the driving axle driven by a clutch in one direction, or by another in the other direction when the engine is reversed, there being hand gear to control the valve when reversing. The exhaust steam was discharged into the funnel as a powerful blast, and, with the large flue employed, carried over much unconsumed fuel. The cylinders were

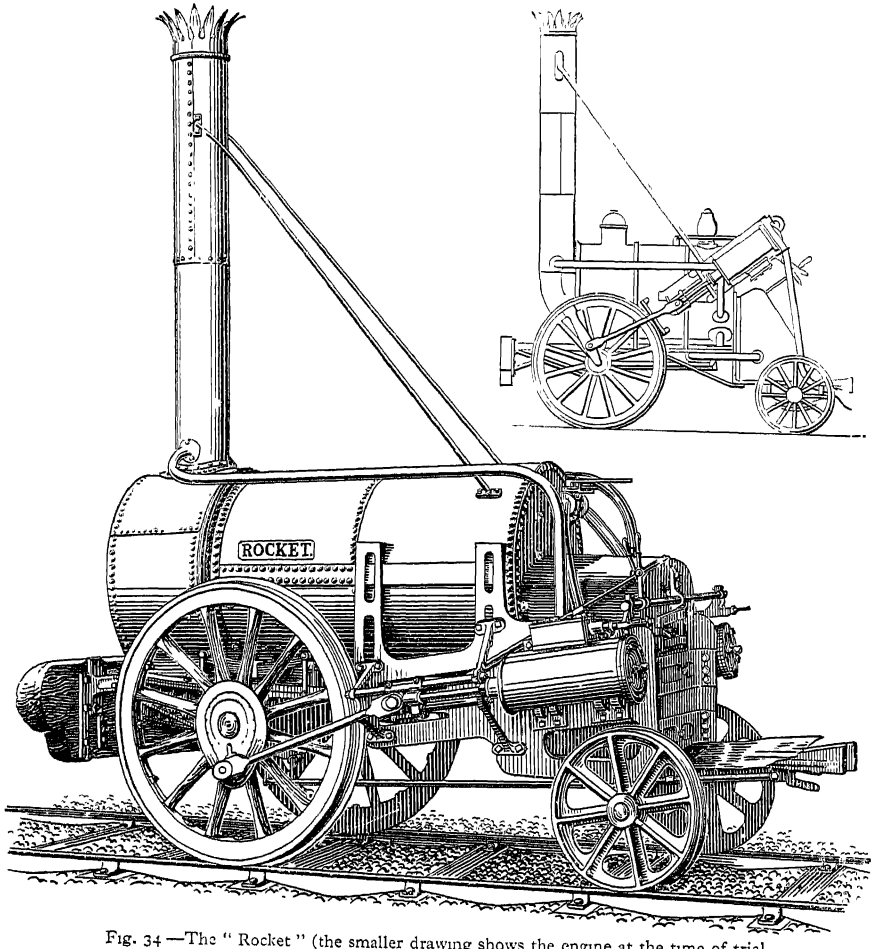


Fig. 34.—The "Rocket" (the smaller drawing shows the engine at the time of trial with the cylinders inclined at an angle of 37°

7 in. diameter and 18 in. stroke acting on four coupled wheels 4·5 ft. diameter, giving a tractive power of 16·3 lb. per pound of mean steam pressure. The boiler had a grate area of 10 sq. ft., and a total heating surface of 90·3 sq. ft. The engine in working trim weighed 4·77 tons; the tender was similar to that of the "Rocket".

The Boiler of the "Rocket".—As all the world knows, the "Rocket" was the winner of the Rainhill competition. Apart from the soundness of the design of the "Rocket" (fig. 34) there were two causes which contributed

largely to its success. One was the improvement of the blast arrangement, and the second, and most important, was the invention of the multitubular boiler. There is some doubt as to whom the credit of obtaining by this means a large heating surface should be really given. The idea seems to have originated with Mr. Henry Booth, the secretary of the Liverpool and Manchester Railway; and it seems likely that Stephenson discussed with him the difficulties of obtaining sufficient steam constantly to fill the cylinders at high speed, or, in other words, of introducing into the boiler sufficient heat to be converted into energy; and that Booth suggested that the difficulty might be overcome by employing a large number of small tubes instead of a single return flue. Having made the suggestion Booth seems to have been content to leave the Stephensons to work out the problem and to solve the mechanical difficulties, which in those days were very great. At all events Stephenson never claimed that the invention was his own, even though some of his biographers have overlooked Booth's share in it. Describing the " Rocket ", the official catalogue to the machinery section of the Victoria and Albert Museum makes no mention of Booth's name. But Smiles,[1] who from his intimate acquaintance with Robert Stephenson must be regarded as the most reliable biographer of father and son, says definitely that while Stephenson was experimenting with small water tubes, with the object of affording supplementary heating surface to two locomotives sent to France for the Lyons and St. Étienne Railway (1829), " Mr. Henry Booth . . . without any knowledge of M. Seguin's [2] proceedings, devised his plan of a tubular boiler, which he brought under the notice of Mr. Stephenson, who at once adopted it and settled the mode in which the fire box and tubes were to be eventually arranged and connected ". In face of this statement it is surprising that so many writers on the early history of the locomotive should have overlooked Mr. Booth's valuable contribution to the success of the " Rocket ". Booth was a skilled mathematician and of an inventive turn of mind, though he was not a trained engineer. He invented a form of screw coupling which was for a long time the standard coupling used on English railways.

To whomsoever therefore the credit of the invention of the multitubular boiler is due, whether it be Stephenson, Booth, Seguin, or, as some would have us believe, Timothy Hackworth (who, be it noted, employed the Trevithick flue in the " Sanspareil "), the fact remains that in the " Rocket " there were embodied the two most essential features of the modern locomotive. As the late Sir George Findlay, for many years general manager of the London and North-Western Railway, happily said of the " Rocket ": " She was the fruitful mother of a race of giants ".[3]

[1] Smiles wrote a private memoir of Henry Booth, in which he shows clearly how great was Booth's share in the success of the " Rocket ".

[2] M. Seguin, engineer of the Lyons and St. Étienne Railway, adopted a plan of horizontal air tubes through which gases passed, which he patented in 1828. Lobet's *Des Chemins de Fer de France* (1845) gives the credit of the invention of the multitubular boiler to Seguin, and of the steam blast to M. Pelletan, but there is little evidence to support the contention.

[3] *The Working and Management of an English Railway.*

According to the official South Kensington description, the engine as it now exists differs in several respects from its form in 1829. The present fire box and smoke box were fitted in 1862, but are incomplete and inaccurate, while the cylinders were originally arranged at an inclination of 37° with the horizontal, but they were altered within a year or two to their present inclination of 8°. The present travelling wheels are modern, but the original ones, which were also of cast iron, were 34 in. in diameter, a size that the higher position of the cylinders rendered admissible. The engine is shown standing on some of the original wrought-iron rails of the Liverpool and Manchester line. The "Rocket" has two cylinders, 8 in. in diameter by 17 in. stroke, the connecting rods acting directly on the driving wheels, 56 in. in diameter; thus giving a tractive power of 19·4 lb. per pound of mean steam pressure. The slide valves are worked by loose eccentrics, and there is a clutch arrangement, worked by a treadle, by which these eccentrics could be thrown out of gear when the engine was to be reversed, the valve at the time being independently worked by hand levers. The boiler (fig. 35) has a cylindrical barrel 3 ft. 4 in. in diameter by 6 ft. long, which was traversed by twenty-five copper tubes 3 in. in diameter. The fire box was of copper, and was bolted on to the end of the barrel; it had at the top, back, and sides a 2·5-in. water space, while there was a firebrick lining in front. The gases from the fire box passed through the tubes into a small chamber at the base of the chimney, which served as a smoke box. The area of the grate was 6 sq. ft., and the heating surface of the fire box 20 sq. ft., but owing to the introduction of the boiler tubes the total heating surface was 138 sq. ft.[1] Two copper pipes, 2·5 in. in diameter, connected the water space surrounding the fire box with that of the barrel, and two similar pipes placed at the top of the fire box placed it in communication with the steam space of the barrel. The steam from the boiler was admitted to the cylinders by two copper pipes which led from a regulating cock fixed above the fire box, and which received steam from a dome above the barrel through an internal pipe. The boiler pressure was limited to 50 lb. by two safety valves 2·5 in. in diameter, one of which was loaded by a spring and lever, while the other was of the lock-up type covered by a dome of tin plate. The feed was introduced by two long-stroke feed pumps worked directly from the crossheads, while the exhaust steam was passed into the chimney by two pipes, each fitted with a blast nozzle 1·5 in. in diameter, by which a draught equivalent to 3 in. of water pressure was ultimately obtained. The framing of the engine is built up of 4-in.-by-1-in. bar iron, and the weight is transmitted to the axle boxes by plate springs. The engine weighed, when empty, 3·25 tons, and in working trim 4·25 tons. The total weight of the engine and tender in working condition was 7·45 tons. The wheel base was 7 ft. 2 in.

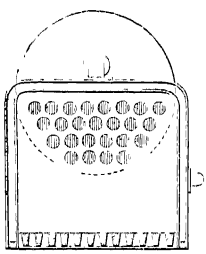


Fig. 35.—Boiler of "Rocket"

[1] "Sanspareil", 90 sq. ft.; "Novelty", 42 sq. ft.; and "Locomotion", 60 sq. ft.

In 1886 Mr. F. W. Webb, of Crewe, constructed a full-size model of the "Rocket" as it appeared at Rainhill (fig. 36), and a photograph of this is also shown in the museum, together with a copy of a drawing prepared by Messrs. R. Stephenson & Co. from the original records remaining in their possession, as well as other drawings.

As may well be supposed, the competition excited tremendous interest. The manner in which the railway company had fought their way through Parliament, the vast amount of money that had been expended on carrying through the line, and the rumours spread by lying tongues, time after time

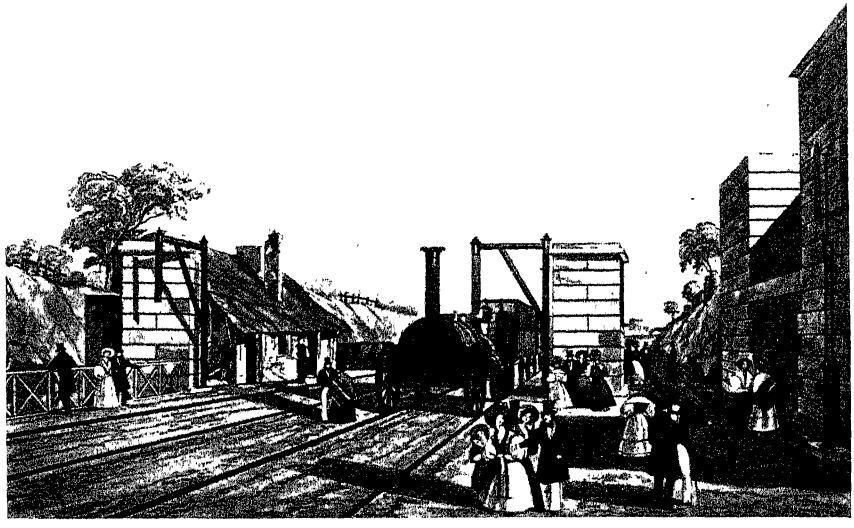


Fig 36.—Rainhill Station (by permission of the L. M. & S. Railway Company)

while the works were in progress, that Chat Moss had engulfed the workmen, and that the Liverpool tunnel had collapsed with calamitous results, had stimulated popular imagination to an extraordinary degree. The Stockton and Darlington Railway had excited little interest beyond the confines of its own county, but the Liverpool and Manchester project formed a topic for every newspaper and review, for club and public-house alike, and there flocked to Rainhill a great concourse of people from all parts of the country.

The Competition.—On the appointed day (6th October) the "Novelty", the "Perseverance", and the "Sanspareil" were uncompleted for the competition. The "Rocket", however, was ready, which as Smiles points out "was quite characteristic of the Stephensons", and was ordered forth to show its paces. We are told that it was by no means the favourite. However, it passed the weighing machine, and the spectators, who were

beginning to chafe at the delays, were entertained to the strange sight of a locomotive travelling at the speed of 13 miles an hour. To their surprise the boiler did not burst, nor were those in charge of the monster suffocated by the fumes it emitted. The public was impressed, and as the crowd dispersed for the night there were many downcast faces among those who had pinned their faith and their interests to horses and canals. On the next day the "Novelty" and the "Sanspareil" were still unable to go through their trials. The "Rocket", however, made another trial spin, and this time it dragged after it a truck containing thirty persons at a speed of from 25 to 30 miles an hour. Braithwaite and Ericsson's engine also ran along the line by way of experiment, occasionally travelling at a high speed. Owing, however, to trouble with the blowing apparatus the engine did not get very far.

On the following morning, 8th October, the "Rocket" was ordered to prepare for its official trial. The process of raising steam was a tedious one, but at length the train was coupled up and the engine was ready to start on its famous journey. The load behind the tender was equivalent to about 12 tons. The first ten trips backward and forward over the measured track—the 35 miles that equalled the journey from one end of the line to the other—were accomplished in one hour and fifty minutes. The return journey was a little less satisfactory, but the average speed for the entire trial worked out at 15 miles an hour—5 miles beyond the speed specified by the company. The highest speed reached was 29 miles an hour, although the "Rocket" afterwards ran 4 miles in 4·5 minutes—a speed of 53 miles an hour. As the engine slowed up at the grand stand, on the conclusion of its task, Mr. Cropper, one of the directors, lifted up his hands and exclaimed: "Now has George Stephenson at last delivered himself!"

Two more days passed before either of the remaining two engines was ready to be tested. Then the "Novelty" was brought forth. With a load of only 7 tons behind it it managed to get along at a good speed. Before, however, it had run 4 miles the delivery pipe of the force pump burst, and it had to be withdrawn from the competition. The "Sanspareil" was not ready until the 13th, and it was then found that it did not comply with the conditions, and was 4 cwt. heavier than had been stipulated for an engine on four wheels. However, it was allowed to run, but after travelling for about 27 miles it broke down, owing to failure of the pumps.[1] It was in many respects a good engine, but it had the drawback of an enormous fuel consumption. The blast was badly arranged, and, besides making a tremendous noise, blew great quantities of partially consumed fuel through the chimney. The "Sanspareil" was bought by the railway company after the trial, and worked on the line for a couple of years, when it was removed to the Bolton and Leigh Railway.[2]

[1] It is also said that one of the "Sanspareil's" cylinders burst owing to faulty casting.

[2] In 1830 Hackworth designed the "Globe" for the Stockton and Darlington Railway The engine was built by Stephenson, and is said to have travelled at a speed of 50 miles an hour.

The success of the " Rocket " had the effect of establishing in the minds of all who had witnessed the trial the great advantage the locomotive possessed when compared with horse traction or fixed engines. Those who had confidently asserted the impossibility of working a railway satisfactorily by locomotive power took care not to repeat their rash statements, and the experts who had scoffed at the idea of ever being able to travel at a speed twice as great as that of the stage coach had to " climb down " ignominiously. The directors of the company considered the £500 well spent. They no longer doubted their engineer, nor did they grudge him the money he had spent on building their line. All confidence in the success of their scheme was restored; they realized with pride that the Liverpool and Manchester Railway would form the nucleus of that mighty network which was to become " great

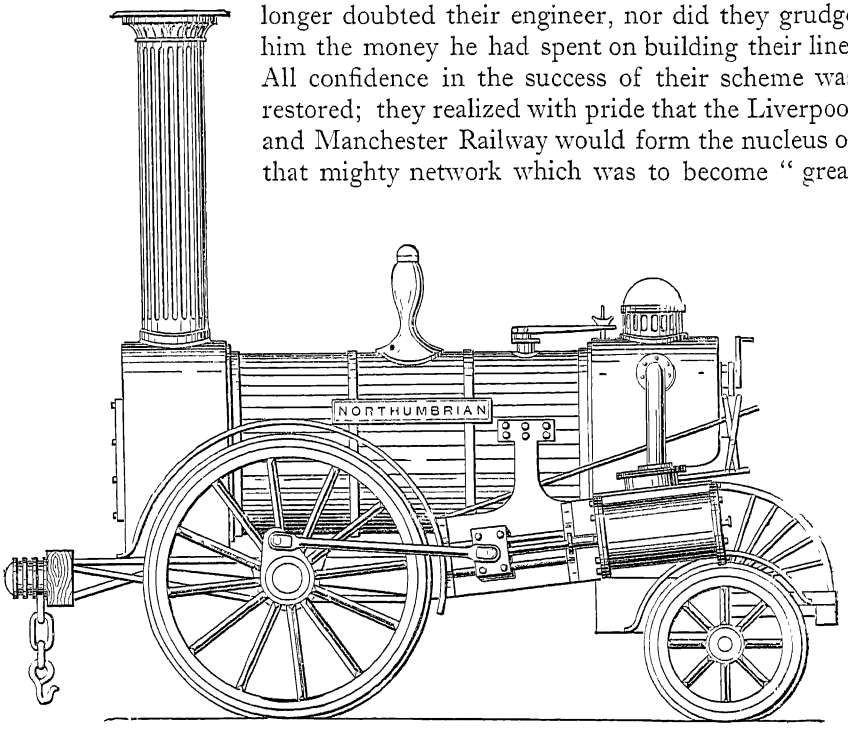


Fig. 37.—The " Northumbrian "

highways for the king and all his subjects ". For Stephenson the 8th of October, 1829, was the proudest day of his life.

The Opening of the Line and the Improvement of the Locomotive.—The railway was now rapidly nearing completion. In June, 1830, a train of directors and friends made a passage over the whole line, the journey being accomplished in an hour and a half, and on 15th September of the same year the public opening of the railway took place. That memorable occasion was made a holiday by the population of the districts through which the line passed. Members of Parliament, the Duke of Wellington—then Prime Minister—and Sir Robert Peel, and any number of lesser celebrities assisted at the ceremony. A cloud was cast over the proceedings by the fatal accident which befell Mr. Huskisson, the member for Liverpool, who was run over by the " Rocket " while he was standing on the line.

The accident had the effect of drawing still greater attention to the possibilities of steam locomotion, for after the accident George Stephenson himself took Mr. Huskisson on the "Northumbrian" (fig. 37), the engine that had led the opening procession of trains, to his destination some 15 miles away in twenty-five minutes, or at a speed of 36 miles an hour.

It is unnecessary to relate that from the first day it carried traffic the Liverpool and Manchester Railway was a great commercial success; but the following figures will give the reader some idea of the extent to which the directors' hopes and anticipations were exceeded. It will be remembered that little had been expected from the passenger traffic, yet this, in the first year, yielded £101,829. The receipts from the goods traffic had been estimated at £50,000, and this figure was exceeded by £30,000. In view of the fact that the line had cost £1,200,000 or £800,000 more than the original

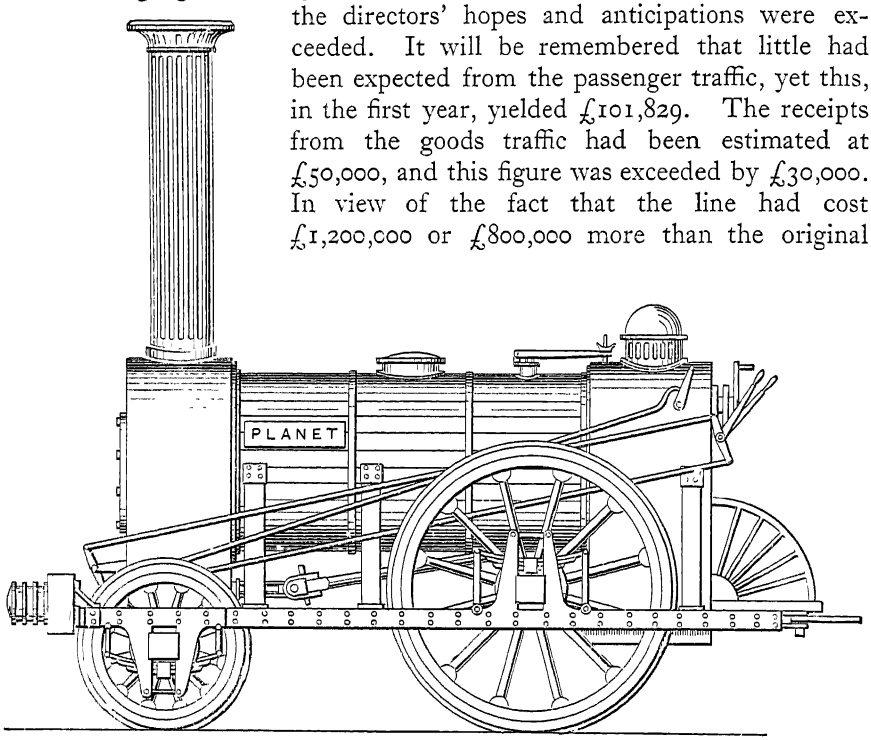


Fig 38.—The "Planet"

estimate, a first year's dividend of 8 per cent can only be regarded as sensational. The impetus to the locomotive given by the Rainhill trials was sufficient to make its development very rapid. Thus the "Northumbrian" of 1830 had a complete smoke box, and in other respects showed great improvements on the "Rocket". The cylinders in the latter engine were originally inclined to the driving wheels at an angle of 37°, in the Northumbrian they were nearly horizontal. The "Planet" (fig. 38), also delivered in the year of the opening of the line, showed still more pronounced improvements. Indeed this engine is specially worthy of attention on account of the general arrangement of its parts. Thus the cylinders were placed at the smoke-box end, and inside the frames, the arrangement which has since been generally adopted, while the following engine, the "Mercury"

(fig. 39), still more closely approached to the latter-day design. A peculiarity of the "Planet" was that the horn blocks for the driving axle were carried above the frame. The whole cranked axle was used in all these engines and was a distinct advance upon the designs which led up to and included the "Rocket".

By 1830 there was a large number of railway schemes afoot. The country had caught the railway fever as badly as it had caught the canal fever many years before. And indeed it seemed for a time as though the lesson taught during the worst days of canal company flotation had been quite forgotten. "Engineers" with schemes grotesque enough for Laputa, and unscrupulous promoters with alluring prospectuses in every pocket, seized as their natural prey a public attracted by the bright reports that came to them from Liverpool. Fortunately

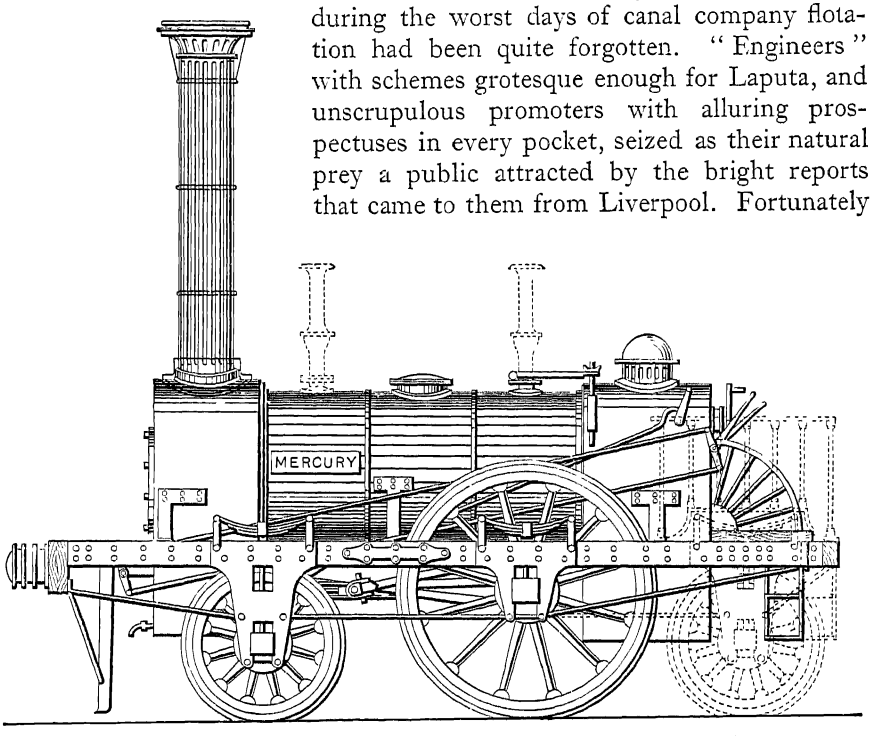


Fig. 39.—The "Mercury" (this engine was afterwards fitted with six wheels)

Parliament was wise enough to sanction but few of these schemes, which was doubtless what the promoters anticipated. The railway promotion, however, of the years which immediately followed the opening of the Liverpool and Manchester Railway was insignificant compared with that which subsequently followed, and which culminated in the "mania" of 1845, and the subsequent financial collapse. In that year there were lodged no fewer than 1263 Bills, representing a capital of £563,000,000 sterling, and involving under the then existing regulation a deposit of actual cash amounting to £59,000,000. The publication of these figures created alarm, a panic ensued, and the stocks of existing railways were greatly depreciated for a time, while the premiums quoted on embryo projects disappeared. Of the total projects of that year only 120 survived the ordeal of Parliament.[1]

[1] E. R. M'Dermott, *Railways*, Methuen, 1904.

It may be worth while now to give a general survey of the development of the railway system in Great Britain during the years 1830 to 1850. At the latter date there were 6621 miles of railway open for traffic and the paid up capital amounted to £240,270,745. Nearly all the principal railways were then incorporated, the only exceptions being the North-Eastern, which was incorporated in 1854, the London, Chatham, and Dover incorporated in 1859, and the Great Eastern incorporated in 1862. Of course large portions of these three railways were already in existence, the North-Eastern, as a matter of fact, embracing the original Stockton and Darlington, although the amalgamation with that particular company did not take place until 1863. Perhaps the best way of studying the development of the railway system would be to take each of the larger companies in turn and examine how they have been built up.

London and North-Western Railway.—This company was actually incorporated in 1846, but it includes within its system the Liverpool and Manchester Railway, the history of which has already been fully set out; the London and Birmingham, Manchester and Birmingham, and Grand Junction Railways. As regards the London and Birmingham Railway, two routes had been projected before the opening of the Liverpool and Manchester line; one was via Oxford and Banbury which had been surveyed by Rennie, and one via Coventry. George Stephenson was called in to advise and he selected the latter route. He and his son, Robert, were appointed joint engineers of the undertaking. The cost of construction was estimated at £2,400,000 but it actually worked out to £5,500,000. The total distance was 112½ miles. The Bill, when it was introduced into Parliament, met with very great opposition from landowners. It passed through the Commons in 1832 but was rejected by the Lords on the motion of Lord Brownlow. The resolution of that House makes curious reading at the present day. It was as under:

> " Resolved that the Directors had not made out a case which would warrant the forcing of the proposed railway through the lands and properties of so great a proportion of distinguished landowners and proprietors."

The Bill was re-introduced in the following year, and in the estimates the allowances for land and compensation had been increased from £250,000 to £750,000. This paved the way for getting rid of the landowners' opposition, and consequently the Bill passed both houses. It is interesting to note that in the original Act it was provided that out of the total number of directors (24) 10 must reside within 20 miles of London and 10 within 20 miles of Birmingham.

The London terminus of the London and Birmingham Railway had been originally fixed at Camden, but it was afterwards decided to extend the line as far as Euston, though up to 1844 the haulage of trains between Euston and Camden was conducted by means of stationary engines and an endless rope owing to the difficulties of the gradient. The railway was by no means an easy one to construct. There are several tunnels of considerable

length, namely, at Kilsby, near Rugby, 2400 yd., Watford, 1800 yd., and Primrose Hill, 1164 yd. But for the fact that Northampton had requested that the railway should not approach the city, much to its subsequent regret, the Kilsby tunnel would not have been necessary. Work on this tunnel was greatly delayed owing to the presence of quicksand. At Primrose Hill the London clay had to be driven through, and at Watford, the chalk. In addition, there was a cutting through the chalk at Tring 2½ miles in length. During the construction of the railway, one curious event was the firing by spontaneous combustion of the embankment at Wolverton owing to the presence of large quantities of iron pyrites. However, the work of construction was pushed on with great vigour; 20,000 men were employed, and the work was accomplished in less than five years, the line being opened throughout on 17th September, 1838. So great an impression did the railway make upon the country that it was regarded in some quarters as the greatest wonder of the world. The famous Doric Arch at Euston was completed in 1839 at a cost of £35,000, and the Euston Hotel was opened two months after the completion of the railway. At Birmingham, the first station was situated in Curzon Street. The first locomotive engineer of the London and Birmingham Railway was Edward Bury, and 36 engines (4-wheel type, with inside cylinders) were provided. Nine passenger trains were put on in each direction, the fast trains accomplishing the journey in 5 hr. and the slow trains in 8¾ hr. One curious feature was the charging of higher fares at night than by day. The signallers in the early days of the railway were designated " policemen ". From a financial point of view the railway was very successful. The original estimate of income was £671,000, but that was very quickly surpassed and a dividend of 10 per cent was paid in 1841.

In 1845 an important extension of the London and Birmingham Railway was made by the construction of the Trent Valley line from Rugby to Stafford via Tamworth and Nuneaton. This connection had the effect of considerably shortening the journey from London to the north.

Almost simultaneously with the construction of the railway to Birmingham from the south, another railway was promoted to Birmingham from the north; in fact as early as 1824 and again in 1826 and 1830, Bills had been promoted for the construction of a line from Birkenhead to Birmingham. It was in 1833, the same year as the passing of the London and Birmingham Act, that the Act for the construction of the Grand Junction Railway for making a line from Warrington to Birmingham was passed. A small railway, 4½ miles, was already in existence between Warrington and Newton, and at the latter place a connection was formed with the Liverpool and Manchester line, so that, by the passing of the London and Birmingham and Grand Junction Railway Acts, railway communication was afforded between the four largest cities in the country, namely, London, Manchester, Birmingham and Liverpool. The Grand Junction Railway Act provided that no parson should be a director of the company. George Stephenson and Locke were appointed engineers for the northern section of the railway, and Raistrick for the southern section. The principal work was the construction of a

viaduct over the River Weaver near Northwich, which consists of 20 arches of 60-ft. span and was built of red sandstone from Runcorn. Another important engineering work was a viaduct of 28 arches where the railway entered Birmingham at Lawley Street. The total length of the Grand Junction Railway was 78 miles. The principal towns en route were Wolverhampton, Walsall, and Stafford, and the line was opened on 4th July, 1837. It is interesting to note that in 1843 Crewe was selected for the site of the Locomotive and Carriage Works of the railway. The rails used in construction were 84 lb. weight per yard and were double-headed and reversible, but the experiment of reversing the rails was not found to be a success. The luggage of passengers was carried on the top of the carriages. In 1837 a Bill was passed for a line from Crewe to Chester, and this was purchased by the Grand Junction Company in 1840. In 1845 the Grand Junction and Liverpool and Manchester Companies amalgamated.

The Manchester and Birmingham Railway was authorized in 1837. It was originally projected from Manchester through Stockport and Congleton to Stone and Chebsey, a distance of 45½ miles. There were also lines from Alderley to Crewe—15 miles—and from Stockport to Macclesfield—11 miles. Two years later it was decided to construct only the portion from Manchester to Crewe, a distance of 30½ miles, and this railway was opened on 10th August, 1842. The engineering works consisted of an important viaduct of 26 arches at Stockport across the Mersey, 1792 ft. in length, and another viaduct over the River Dove 1717 ft. long. The station at Manchester was at London Road. One curious announcement concerning the conveyance of passengers was as follows:

> " The first compartment of the leading carriage in first class trains is reserved for servants in livery at second class fares and other servants in attendance on their employees may ride outside if there be room by first class trains at the same rate."

All these railways referred to were amalgamated on 16th July, 1846, and together made the London and North-Western Railway with a route mileage of 420 miles.

Meanwhile, other railways which subsequently became part of the London and North-Western system had been commenced. In 1834 the North Union Railway extended the through communication northwards as far as Preston, and in 1837 the Lancaster and Preston Junction Railway continued the advance as far as Lancaster. In 1844 the Lancaster and Carlisle line was authorized. This line was opened two years later and cost £1,300,000. The principal feature of the line is the very stiff climb over Shapfells, the gradient being 1 in 75 for four or five miles. This line was leased to the London and North-Western in 1859 for 999 years.

The Chester and Holyhead Railway was authorized in 1844. It extended for 85 miles and was opened from Chester to Bangor on 1st May, 1848. One of the most serious difficulties in the construction of the line was in the vicinity of Penmaenmawr, where the mountains go right down to the sea. Heavy cutting and embankment work together with a tunnel and a viaduct

were required in order to get round the headland. Then, in addition, the River Conway and the Menai Strait had to be spanned, and it was decided to construct tubular bridges for this purpose. That over the River Conway was a comparatively small work and consisted of two parallel tubes each weighing 1180 tons and each of 400-ft. span resting in masonry towers at each end. The bridging of the Menai Strait was a much more difficult task. Three towers (fig. 40) were constructed, the central one (230 ft. in height) being placed upon the Britannia Rock in the middle of the Strait. From the abutments to the side towers, two parallel tubes, each of 230-ft. span, and from the side towers to the central tower two parallel tubes of

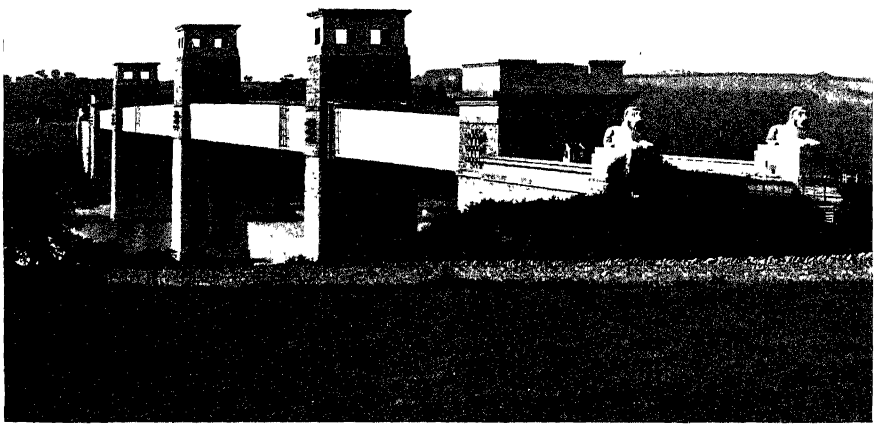


Fig. 40 —Britannia Tubular Bridge over the Menai Strait

460-ft. span, were constructed. The tubes were floated out on pontoons and were then raised by hydraulic power inch by inch into position. The bridge was opened on 19th October, 1850.

In connection with the construction of this railway, a fleet of four boats, *Anglia*, *Scotia*, *Hibernia*, and *Cambria*, was built in 1848 to establish communication between Holyhead and Ireland. The Chester and Holyhead line was amalgamated with the London and North-Western in 1858.

Before 1850, two other important railways, the Huddersfield and Manchester and the Leeds, Dewsbury, and Manchester were absorbed in the North-Western system, and in the same year, 1847, the company took over a lease of the Shropshire Union Railways and Canals and of the Birmingham, Wolverhampton, and Stour Valley Railway.

Midland Railway.—The oldest portion of the Midland Railway is the line between Leicester and Swannington. This railway was commenced about the end of 1830 and opened on 17th July, 1832. It had for its object

much the same as that of the Stockton and Darlington, namely, the provision of cheap transport for coal from the Charnwood Forest district to Leicester. Hitherto, the coal had been brought by canal from the Derby and Nottingham coalfield, and the Charnwood Forest coal was kept out of the market for want of adequate communication. The line was surveyed by George Stephenson at the request of Mr. John Ellis of Leicester. He reported favourably thereon, and his son, Robert Stephenson, was appointed engineer. The line was 16 miles in length. The first engine was the "Comet" and it was built by the Stephensons at Newcastle. Two interesting facts are associated with the Leicester and Swannington line; one was the arrangement of supplying octagonal metal discs as tickets to passengers. These were collected at destination and used over and over again. The other point of interest was the introduction of the locomotive whistle. One of the Leicester and Swannington engines, when passing over a level crossing, ran into a horse and cart. This accident was reported to Stephenson by the manager of the line, who asked whether it was not possible to have a whistle fitted on the engine which the steam could blow. "A very good thought," replied Stephenson; "you go to Mr. So and So, musical instrument maker, and get a model made and we will have a steam whistle and put it on the next engine that comes on the line." The Leicester and Swannington line was subsequently acquired by the Midland Company, who guaranteed a dividend of 8 per cent on the capital. With the opening of the Leicester and Swannington line, the cost of coal at Leicester was reduced. The Notts and Derby coal-owners became alarmed, but as they could not get the canal companies to agree to a sufficient reduction in the rates to meet the competition, they resolved at a meeting at Eastwood on the 16th August, 1832, to make a railway in place of the canal. A line was accordingly projected from Leicester to Pinxton, but in November, 1833, the scheme took the form of a railway described as the Midland Counties Railway to connect the towns of Leicester, Nottingham, and Derby, make a connection with the London and Birmingham line at Rugby, and incidentally make a branch to Pinxton. Delay took place and the route was re-surveyed in 1835 by Mr. Vignoles, and the Bill came before Parliament in 1836. It passed successfully, with, however, the deletion of the proposed extension to the collieries in the Erewash Valley. It was not until 1844 that the Erewash Valley project was revived, being then backed by the Midland Company who guaranteed 6 per cent on the capital, and the line was opened in 1847.

One of the most important engineering works on the Midland Counties Railway was the bridge over the River Trent. The railway was opened on 30th May, 1839.

Meanwhile, George Stephenson in 1835 had been surveying routes to connect Derby with Leeds and Derby with Birmingham. For the former a Bill was obtained in 1836, the line being known as the North Midland Railway, and it was opened on 11th May, 1840. There was a good deal of heavy engineering work, which included the long tunnel at Clay Cross and

six other tunnels and 200 bridges. It was at that time considered to be too big an engineering problem to carry the railway direct into Sheffield, and it was therefore taken by an easier route to the east; but a separate company, the Sheffield and Rotherham, was formed to give access to Sheffield from the north. At Normanton important connections were made with the York and North Midland and Manchester and Leeds companies.

The Birmingham and Derby line was commenced in 1837. It was a somewhat easier line to construct, but there was a viaduct near Walton ¼ mile in length, and another important construction was the Anker Viaduct near Tamworth, 600 ft. long. The construction of this Birmingham and Derby line immediately caused competition with the Midland Counties line for London traffic. In 1844 the three companies were amalgamated as the Midland Company, the celebrated George Hudson being the first chairman.

The Birmingham and Bristol line, which became an important part of the Midland System, was suggested as far back as 1824, but the project never matured. In 1832 a line between Birmingham and Gloucester was proposed and Brunel was employed to survey it. This Bill had the good fortune to pass Parliament at the first attempt. One well-known feature of this line is the Lickey incline with a gradient of 1 in 37 for two miles. Both Stephenson and Brunel thought the working of this incline by locomotives would be impracticable, but Captain Moorson, who had been in America, had seen engines mount inclines equally steep, and a dozen were ordered from Philadelphia. These engines had driving wheels of only 3 ft. in diameter, but they did all that was expected of them.

In making the railway from Birmingham to Gloucester, use was made of the Cheltenham and Gloucester Tramway, which had been constructed 30 years previously and worked first by horses and then by locomotives. It was agreed that if the Great Western Company continued their line from Swindon, they should share in the use and cost of the tramway. The part of the line between Cheltenham and Bromsgrove at the foot of the Lickey Hills, 31 miles in length, was opened on 24th June, 1840.

The Bristol and Gloucester Railway was originally constructed as a broad-gauge line as the railways both to the east and south were of that gauge. Brunel was moreover the engineer. The line was opened on 8th July, 1844, and the evil effects of the break of gauge at Gloucester were at once apparent. The Great Western and Midland companies both tried to purchase the Birmingham and Gloucester line in 1845. The former offered share capital, but the Midland guaranteed a 6 per cent dividend and beat their rivals. So pleased was the London and North-Western Company with the Midland's success that they granted that company access to the New Street Station at Birmingham at a nominal rent of £100 per annum.

Another important extension of the Midland Railway was the line from Syston to Peterborough. This was opened on 1st May, 1848, two years before two rival proposals were made to construct lines from Leicester southward. One was the Leicester and Bedford and the other the South Midland. The former was intended to join the Great Northern at Hitchin

and so provide an alternative route to London instead of the routes via Rugby or Birmingham. Negotiations resulted in this line being transferred to the Midland Company, but nothing was done at the time and the powers expired in 1850, though they were subsequently revived and the railway was opened in 1858. In 1846 a 999 years' lease of the Leeds and Bradford Railway, then in course of construction, was entered into on a guarantee of 10 per cent dividend.

In 1846 and 1847, during Mr. Hudson's chairmanship of the Midland Company, a very large number of Bills for extensions of the railway system were brought forward, and although some of them bore fruit, the financial crisis caused the abandonment at any rate for a time of many of these ambitious proposals.

Nevertheless, before 1850 numerous extensions had been made, chief among them being the following:

Nottingham to Lincoln, 1846.
Shipley to Skipton, 1847.
Lancaster to Morecambe, 1848.
Nottingham to Kirby and Mansfield, 1848 and 1849.
Leicester to Burton, 1849.
Ambergate to Rowsley, 1849.
Skipton to Lancaster, 1850.

North-Eastern.—The North-Eastern Railway, when incorporated in 1854, was the result of an amalgamation of the York and North Midland; York, Newcastle, and Berwick; and Leeds Northern Companies. The first-named included the important line between York and Normanton, at which point a connection was made with the North Midland Railway, and an Act for this purpose was obtained in 1835. Two years before, a company had been formed for the construction of a railway from York to Leeds. George Hudson, a York draper, was one of the promoters, and between 1830 and 1850 he exercised a tremendous influence upon the development of the railway system in the north-east of England. In addition to the York and Normanton line, railways were constructed between York and Scarborough, with a branch to Pickering, opened in 1845; and from Scarborough to Hull under powers obtained in the same year. In 1847 and 1848, lines were opened from York to Market Weighton and from Selby to Market Weighton, from York to Knaresborough, and Church Fenton to Harrogate. The last named included a long viaduct 110 ft. in height over the Crimple Valley, consisting of 31 arches of 50-ft. span. The York and North Midland also included the railway from Whitby to Pickering, an Act for which had been obtained in 1833. This railway was constructed at very low cost and passed through one of the most romantic valleys in Yorkshire. At Goathland there was an incline some 1500 yd. in length worked by means of a rope. The gradients on this line were severe and the line was worked at first by horses, though in some places the coaches were able to descend the falling gradients by gravitation.

To increase the traffic on the Whitby and Pickering line, Mr. Hudson started the Whitby Building Company who acquired the West Cliff fields

and laid them out with streets and terraces for the accommodation of visitors.

The York and North Midland Company also took over the lease of the Leeds and Selby Railway which had been opened in 1834, and of the Hull and Selby Railway which had been opened in 1840, and they thus practically secured the monopoly of transport in south-east Yorkshire and parts of the North Riding. The River Ouse was crossed at Selby by means of a bascule bridge.

The York, Newcastle, and Berwick Railway took shape originally as the Great North of England Railway for the construction of a line from Gateshead to York. The promoters met with considerable opposition from landowners and, in particular, the Durham College authorities, who declared that the railway would encourage the establishment of manufactories in the city of Durham, and these would improve neither the health nor the morals of the young gentlemen who would perhaps be studying cotton more than the classics. The route was consequently diverted to the east of Durham. The section between York and Darlington was opened for passenger traffic in 1841, the engineering works including an important skew bridge over the River Tees 471 ft. in length, and a stone bridge 300 ft. long over the River Ouse near York. The construction of the northern section hung fire, but an Act was obtained in 1842 known as the Newcastle and Darlington Junction Railway Act, and the line was opened throughout from York to Gateshead in 1844. There were three timber viaducts between Shincliffe and Sherburn, the largest being 660 ft. in length. Continuous railway communication was thus afforded between London, Euston, and Gateshead, and the journey was performed for the first time in 9 hr. 21 mins. or 8 hr. 11 min. after deduction of stops. It was the practice in those days to run very long trains, and an instance is on record of a train of 72 carriages drawn by 6 engines being run in the year the line was opened to convey passengers from Gateshead, South Shields, and Sunderland to York. In the same year, a project was set on foot for the construction of a line from Newcastle to Berwick and a Bill was obtained in 1845, the line being opened on 1st July, 1847. There were important bridges over the Rivers Blyth, Wansbeck, Coquet, and Aln. Two important links were, however, wanted to establish through communication with Scotland, namely, a bridge over the Tyne at Newcastle and over the Tweed at Berwick. The former, the celebrated High Level Bridge, was opened on 15th August, 1849. It was designed by Robert Stephenson and cost £243,000, whilst another £250,000 was spent on land and approaches. 5000 tons of iron-work were used in the construction. A unique feature of this bridge is that a roadway is carried below the railway. The Royal Border Bridge (fig. 41) over the Tweed was opened a year later by Queen Victoria. It also was designed by Robert Stephenson and cost £120,000. It consists of 28 arches with a total length of 2160 ft., and the height above the bed of the river is 126½ ft.

Meanwhile powers had been obtained for the construction of a new trunk line from London which would give direct communication with York.

George Hudson was at first strongly opposed to this new railway as he was then chairman of both the Midland, and York and North Midland Railways. The York and Newcastle Company, however, were not indisposed to welcome the new arrival, and Hudson therefore determined to obtain and succeeded in obtaining a controlling influence in this line. He, however, eventually saw that it would be policy to make terms with the Great Northern, as the new line was called, and a branch line was promoted from the York and North Midland at Burton Salmon to Knottingley, which had the effect of making a physical connection with the Great Northern route. This railway crossed the River Aire by means of a tubular bridge designed by

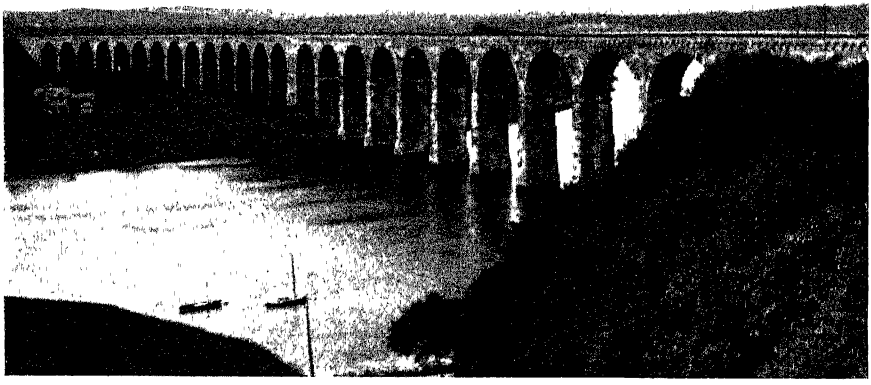


Fig. 41.—Royal Border Bridge, Berwick-on-Tweed Photo, Valentine

Robert Stephenson. The Midland Company were much incensed at Hudson's action, and it led to the severance of his connection with that company.

Another railway which deserves mention is the Newcastle and Carlisle line. Originally the idea was to construct a ship canal between the Tyne and the Solway, but it was quickly seen that a railway would be the sounder proposal, and a meeting took place at Newcastle on 21st August, 1824, to consider a scheme. Within six months a company was formed with a capital of £300,000, but the Bill did not come before Parliament until some time later, the Act being obtained in 1829. The railway was opened throughout in 1838, and included important viaducts at Wetheral and Corbridge and over the River Gelt, together with a mile-long cutting, in one place 110 ft. deep, through the Cowran Hills near How Mill. There were in addition two short tunnels. Access was given to Newcastle by means of a timber

bridge over the Tyne at Scotswood, which was opened in the following year. One important fact about the Newcastle and Carlisle Railway was the Ticket Dating Press which was invented by Thomas Edmondson, the Station Master at Milton, now Brampton Junction.

North of Newcastle, railways were opened between Newcastle and North Shields, and in 1845 powers were obtained for the Blyth and Tyne Junction Railway. This was the nucleus of an important sequence of lines which were not amalgamated with the North-Eastern Company until 1874.

The Leeds Northern Railway commenced with a line from Leeds to Thirsk, with branches to Knaresborough and Harrogate, for which an Act had been obtained in 1845. A year later, power was obtained to extend the railway to Billingham near Stockton, and to purchase the Stockton and Hartlepool Railway which had been opened in 1841. Some heavy engineering work was required for the construction of the section between Leeds and Harrogate, including the Bramhope Tunnel, 2 miles in length, and stone viaducts over the Rivers Aire, Wharfe, Crimple and Nidd. The Ure was bridged at Ripon by means of a timber viaduct.

Meanwhile, the Stockton and Darlington Railway had been steadily extending its line, and in 1828 it obtained powers to continue the railway to Middlesborough, the line being opened two years later, whilst the dock at Middlesborough was opened in 1842. This railway included a suspension bridge over the River Tees, which unfortunately proved a failure and had to be reconstructed. Further extensions were made in West Durham, and it was not until 1863 that the line lost its identity by amalgamation with the North-Eastern.

Space does not permit us to go into detail respecting the construction of the other large railway systems, but brief notes may be given respecting the principal features.

The Great Western.—This Company was incorporated in 1835 for the construction of a railway from London to Bristol and the line was opened throughout in 1841. Brunel's name is always associated with the Great Western Railway and he was the pioneer of the broad gauge. It was not until 1892 that the last trace of the broad-gauge system in this country disappeared. Before the end of 1850 other important sections of railway, which ultimately became linked with the Great Western, were opened, including the Bristol and Exeter, South Wales, South Devon (this line was worked on the atmospheric system), Cheltenham and Great Western Union, and Didcot and Birmingham. Branches were also constructed to Salisbury and Weymouth.

One of the earliest and most notable engines used on the Great Western Railway was the "North Star", constructed by Robert Stephenson & Company in 1837. This engine had driving wheels of the unusual size of 7 ft. in diameter, in order to meet Brunel's wish for high speed working.

Lancashire and Yorkshire.—The nucleus of the Lancashire and Yorkshire Railway was a line from Manchester to Leeds which had been suggested as early as 1825. Plans were deposited in 1836 and the line was

opened throughout in 1841. A still older railway was one between Manchester and Bolton, for which an Act had been obtained in 1831 with a view to converting the canal into a railway. This scheme was never carried out, but a line was constructed and opened in 1838. When the Lancashire and Yorkshire Company was formed in 1847 it included, in addition to the railways mentioned, the Liverpool and Bury, the West Riding Union, the East Lancashire, serving the towns of Bury, Accrington, Blackburn, Burnley, and Preston, and the Liverpool, Ormskirk, and Preston lines.

London and South-Western.—This was originally the London and Southampton Railway which was opened throughout on 1st May, 1840. Extensions were made to Salisbury and Dorchester in 1847, to Windsor and Portsmouth in 1848, and to Guildford and Hampton Court in 1849. The isolated Bodmin and Wadebridge line, opened in 1834, was acquired by the South-Western Company in 1845, but it was not directly connected with the parent system until fifty years later.

London, Brighton, and South Coast.—The first section of this railway was a line from London to Croydon, opened in 1839. Upon it the atmospheric system was tried for a year. The line from London to Brighton was opened throughout in 1841, and between 1845 and 1850 communication was established with Worthing, Chichester, Lewes, Hastings, Portsmouth, Epsom, Newhaven, Horsham, and Eastbourne.

South-Eastern.—This railway includes the original London and Greenwich Railway which had been opened in 1837, and a still older line, the Canterbury and Whitstable, opened in 1830. The latter was originally worked by stationary engines on account of the gradients and subsequently by horses. The South-Eastern Company was itself incorporated in 1836.

Great Central.—The earliest portion of the Great Central was the Sheffield–Ashton-under-Lyne and Manchester Railway, which was incorporated in 1837 and completed in 1845. It includes the Woodhead Tunnel, 3 miles in length, through the Pennines. In 1847 amalgamation was made with the Sheffield and Lincolnshire, Great Grimsby and Sheffield Junction, and Great Grimsby Docks Companies, thus forming the Manchester, Sheffield, and Lincolnshire Railway, by which name it was known until the close of the nineteenth century when, with the opening of the London extension, the name was changed to Great Central.

Great Eastern.—This system includes the Eastern Counties line from London to Colchester and the Northern and Eastern, both incorporated in 1836 and originally constructed to a 5-ft. gauge. The Northern and Eastern extended from Stratford to Cambridge and Hertford. Later on, the Yarmouth and Norwich, Norwich and Brandon, Eastern Union (from Colchester to Ipswich), Ipswich and Bury, Lynn and Ely, Lynn and Dereham, and Ely and Huntingdon lines were added.

Great Northern.—This railway was the outcome of two rival schemes, the London and York and the Direct Northern, promoted in 1844. After a fierce Parliamentary struggle, powers were obtained in 1846. The first section of the railway brought into use was from Louth to New Holland on

the Humber, opened on 1st March, 1848. By 8th August, 1850, through communication was established between London via Lincoln and York and beyond to Edinburgh. The direct line from Peterborough to Retford was not opened until two years later.

Caledonian.—This line was incorporated in 1845 also after a fierce Parliamentary struggle, and on 15th February, 1848, it was opened between Carlisle and Glasgow and Edinburgh. In the same year, the Scottish Central Railway was opened, thus giving access to Perth, and two years later the Scottish North-Eastern completed the route to Aberdeen. These two lines eventually became part of the Caledonian system, which includes two older undertakings, the Glasgow, Garnkirk, and Coatbridge opened in 1831, and the Wishaw and Coltness opened in 1841. The Glasgow, Paisley, and Greenock Railway, opened in the same year, was amalgamated in 1847.

Glasgow and South-Western.—This railway included in its system the oldest Scottish line, namely, that between Kilmarnock and Troon opened in 1811 and worked by horses. Through communication between Carlisle and Glasgow was established in 1850, ten years after the opening of the Glasgow, Paisley, Kilmarnock, and Ayr line.

North British.—This railway was incorporated in 1844 for the construction of a line from Edinburgh to Berwick, which was opened on 22nd June, 1846. It included one very old line, the Monkland and Kirkintilloch, opened in 1826, together with the Edinburgh and Glasgow opened in 1842, Edinburgh and Dundee opened in 1847, and Edinburgh and Hawick opened in the same year.

We have now epitomized the first years of railway history in this country. We have not space to deal with the history of the years during which the railway industry has established itself as the foremost means of transport throughout the world. Notable engineering feats have been accomplished during the time, including the building of splendid bridges such as those across the Tay and Forth, long tunnels in the Peak district and underneath the River Severn, and the acquisition and construction of magnificent docks and harbours. The railways have penetrated into the remotest parts of the kingdom, new trunk routes have been made, and steam is now giving place to electricity, especially in the neighbourhood of London and other great centres of population. The Railways Act of 1921 (Vol. II, p. 259) has wrought wholesale changes in the system of ownership, and many names so familiar to railway travellers for many years are now disappearing.

We may well echo to-day words which were uttered by Robert Stephenson in 1850. "It seems to me," he said, "but as yesterday that I was engaged as an assistant in laying out the Stockton and Darlington Railway. Since then the Liverpool and Manchester and a hundred other great works have sprung into existence. As I look back upon these stupendous undertakings, accomplished in so short a time, it seems as though we had realized in our generation the fabled powers of the magician's wand. Hills have been cut down and valleys filled up; and when these simple expedients have not sufficed, high and magnificent viaducts have been raised, and if mountains

stood in the way, tunnels of unexampled magnitude have pierced them through, bearing their triumphant attestation to the indomitable energy of the nation, and the unrivalled skill of our artisans." No railway man can help feeling the thrill of pride which those words induce. As he spoke them Robert Stephenson himself was filled with proud reflections of the works that he himself had consummated; perhaps with still prouder reflections of the courage, the indomitable perseverance, the genius, withal the gentleness he inherited from England's master engineer, and one of England's best gentlemen.

THE CONSTITUTION OF RAILWAY COMPANIES: THEIR FINANCIAL AND LEGAL STATUS

BY THE LATE

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CHAPTER I

Directors and Officers

Railways have in this country been built purely as industrial undertakings, i.e. with a view to providing and selling to the public a commodity for which there is an anticipated demand, at a profit yielding a sufficient return to warrant the outlay. In some countries the State has built the railways, in order to open out unsettled districts, to assist industries, or for strategical purposes; but in the British Isles the railway system—with some few unimportant exceptions, mainly in Ireland—has been constructed without Government assistance, by private investors, the dividends to be earned and distributed being their inducements for joining in the enterprise. The fact that railways in this country are authorized by Parliament, after careful inquiries by Committees of both Houses, the high standing of most of the directors, and the honesty which has characterized the management of the undertakings—dishonest railway officials have been so few as to emphasize the general rule—have, from the early days of the enterprise, made home railway stocks a favourite form of investment with a large section of the community. It is, indeed, a peculiarity of our railway system that there are more of the public interested in it financially than is the case with any other industry in the country. Any injustice done to railway interests for the benefit of the traders or other bodies thus affects a vast number of stockholders who have put their money into the undertakings on the faith of Parliamentary powers.

The Proprietors of British Railways.—The average holding of British railway stocks is, indeed, much smaller than is generally supposed. Although the capital of most railway companies (as before grouping) amounted to millions of pounds, shareholders were so numerous that the

average holdings, even in the biggest companies, usually ranged between £1200 and £1800, there being two or three instances only where £2000 was exceeded. Analysed further, the maximum average holding of debenture stock was only £3071, and but few companies exceeded £2000; preference and guaranteed stocks gave averages between £750 and £2180; and for the ordinary stocks only two companies showed averages above £2000, the usual average being, in England and Scotland, £1000 to £2000. In 1921 more detailed particulars were made public, showing that the numbers of holdings of between £800 and £1000, of all classes, rarely exceeded about 20 per cent of the total numbers of shareholdings, and in many cases very much less, the great bulk of the capital being in holdings of less than £800. The respective averages for companies which were members of the Railway Companies' Association were as follows:

	Number of Holdings.	£500 and under	£500 to £1000.
		Per cent.	Per cent.
Ordinary	418,636	62·229	19·208
Preferential	408,755	54·727	20·565
Ordinary and Preferential ..	827,391	58·523	19·878
Debenture Stock and Loans	219,886	45·524	22·637

The preliminary amalgamations of 1922 and those completed in 1923, as required by the Railways Act of 1921, have materially affected these figures in many respects, in that the respective holdings have had to be converted in terms of standard values, the conversion taking account of Stock Exchange, market, and dividend-earning values. On the whole, however, this is merely a re-allocation which does not affect the main issue, that the average shareholdings are relatively small, the large capital totals being distributed among hundreds of thousands of shareholders, but few being of considerable magnitude. Moreover, the tendency is rather towards reducing the average holding, as it is quite usual for large blocks of stock, when they come on the market, to be broken up into small lots. It must also be remembered that in the case of a trust the stock may stand in one (that of the Public Trustee, for instance) or two names, on behalf of others (few or many) who are not recognized individually, but who are the real owners of the holdings. Similarly, an insurance company or a trade union may invest some of its funds in railway stocks, though the directors or officials in whose names the stocks stand merely represent the shareholders or members who actually benefit from the investments. Holders of ordinary and preference stocks are the proprietors of the railways, whilst the debenture holders may be called the mortgagees, but with the very important qualification that they have, since 1867, had only the earnings of the lines as security for their advances, and have no power to foreclose or to stop the working of the road.

In that year Lord Justice Cairns gave the judgment of the Court of Appeal in a suit brought against the London, Chatham, and Dover Railway, in which he said: "The living and going concern (i.e. the railway) thus created by the Legislature must not, under a contract pledging it as security, be destroyed, broken up, or annihilated. The tolls and sums of money *ejusdem generis*—that is to say, the earnings of the undertaking must be made available to satisfy the mortgage; but, in my opinion, the mortgagees cannot, under their mortgages, or as mortgagees, by seizing or calling on this court to seize the capital, or the lands, or the proceeds of sales of land, or the stock of the undertaking, either prevent its completion, or reduce it into its original elements when it has been completed." Under the Railway Companies Act, 1867, a temporary measure made perpetual in 1875, the engines, carriages, &c., constituting the rolling stock and plant of a railway company are not, after the railway or any part of it is open for public traffic, liable to be taken in execution.

The Control of the Business.—The foregoing remarks make it clear, therefore, that in regard to British railways the voting power for controlling the management of the lines is held by the great body of the shareholders, and is not, as in the case of American railways, in the hands of a few gigantic holders or syndicates. There was at one time a danger of such control being secured by companies formed to convert the ordinary stocks of such railways as had not already divided their stocks into preferred and deferred, the inducement being the offer of two classes of securities—with dividends secured and fluctuating—which, combined, would fetch a higher market price than the stock for which they were exchanged, the total dividend return on the two being, of course, the same. Fortunately, owing to various causes, holders of railway ordinary stocks found that there was not much to be gained by the exchange, one great drawback to the new securities being that there was not the same free market for them as for the ordinary capital.

It was, indeed, to prevent the possibility of such undesirable holdings being secured by a few individuals that the directors of some of the companies decided to convert their ordinary stock into preferred and deferred, thus giving the holders direct the advantages which the conversion companies held out through their securities. Railway shareholders very rightly have perfect confidence in their directors and officials, but if their management gives results which show that their confidence is misplaced they can always turn out the board and elect a new one.

The Appointment of Directors.—The ordinary, guaranteed, and preference stockholders are the proprietors of the railways. When a bill incorporating a new railway receives the royal assent, the Act names the first Board of Directors, who continue in office until the first ordinary meeting, at which the shareholders elect either the old members or others to take their places. The Board then elect one of their number chairman, and one or more to act as his deputy or deputies, when the undertaking is of sufficient magnitude to render such assistance desirable. In this country men of the highest standing have, from the earliest days, been found to

give their time as railway directors for rates of remuneration which, for many of them, are practically nominal. Useful additions to the Boards have resulted from the election as directors of retired general managers and other officers who combine expert experience of practical railway working with knowledge of financial aspects acquired as officers and due to their necessarily close association with the directors at Board meetings, on committees, and in other ways.

Directors of Amalgamated Railways.—The grouping of railways, as prescribed by the Railways Act of 1921 (Vol. II, p. 259), has altered the situation in some respects, in that the numbers of directors are now very much fewer than in the past, while the individual directors have correspondingly increased representative responsibility. In the Second Schedule of the Railways Act, 1921, relating to the four grouped companies, it was provided that, for the period commencing on the date when the amalgamation scheme came into operation and ending on the date of the general meeting of the amalgamated company in the following year, " the company shall be directed by a Board consisting of such number of persons as may be fixed by the scheme elected by the proprietors of the several constituent companies not exceeding, in the case of the North-Western, Midland, and West Scottish Group, and the North-Eastern, Eastern, and East Scottish Group, twenty-eight, and in the case of the Western Group, twenty-five, and in the case of the Southern Group, twenty-one ".

It was further provided that " before the date when the amalgamation scheme comes into operation the proprietors of each constituent company shall elect from amongst the directors of the company holding office at the time such number as may be fixed by the scheme to serve as directors of amalgamated companies as aforesaid. The directors so elected shall hold office until the date of the said general meeting and shall then retire, but any director so retiring may, if otherwise qualified, be elected as a director of the company under the provisions hereinafter contained. In the event of a casual vacancy occurring during the said period amongst the directors, the vacancy shall be filled by a person co-opted by the other directors, being a person who was a director of the constituent company by the proprietors of which the vacating director was elected."

After the First Year.—Part II of the Schedule provided that " as from the date of the general meeting of the amalgamated company in the year following that in which the amalgamation scheme comes into operation, the company shall be directed by a board of directors consisting of such number of members elected by the proprietors of the company as may be specified in the scheme ", not exceeding the figures already mentioned. " The qualification of a director shall be the holding in his own right of such amount of the share capital of the amalgamated company as may be specified in the scheme, and, subject as hereinafter provided, the term of office of such a director shall be three years, but on retirement he may, if otherwise qualified, be re-elected. Any casual vacancy occurring among the directors shall be filled by a person co-opted by the other directors, and any director

co-opted to fill a casual vacancy shall hold office for the same period as that for which his predecessor would have held office."

Subject to the provisions of the Second Schedule "the provisions of the Companies Clauses (Consolidation) Act, 1845, with respect to the appointment and rotation of directors shall apply". Indeed, except for the special factors associated with the general amalgamations under the Railways Act of 1921, the situation is not materially altered, and, as before, the directors are the elected representatives of the shareholders, deputed to watch the interests of those they represent, as in the case of companies which are not affected by grouping. The term "proprietors" covers the holders of ordinary, preference, and guaranteed stocks.

Committees of the Board.—Owing to the wide range of duties to be covered, and the magnitude of the operations of a large railway company, it is usual to form a number of committees of the Board, each taking charge of a separate department, such as the engineering, locomotive, carriage and wagon or traffic, and these committees meet regularly to receive general reports as to the work done, and special communications directing attention to matters outside ordinary routine returns. Each committee keeps its own minutes, and these are read at the general Board meetings, discussed when necessary, and confirmed or rejected as the case may be, though naturally their recommendations are, in most cases, approved. For example, in the case of the Southern Railway, whose organization, following upon amalgamation, was recently set forth in very full detail, the following committees of the Board were specified and their duties clearly indicated:

1. Law and medical.
2. Traffic (including Continental traffic).
3. Engineering and estate.
4. Locomotive, carriage, and wagon.
5. Docks and marine.
6. Stores.
7. Finance and rating.

Matters dealt with by the respective committees have, of course, to be submitted to the full Board.

Operating Organizations.—It is clear that the organization for working a railway system covering some thousands of miles must be of a more elaborate character than would be required for a line of, say, 300 miles, and the four great groups lost no time in establishing systems to meet the new conditions, though certain modifications have been made since in some instances, and in each case, except perhaps in regard to the Great Western Railway, the organization is still more or less tentative and in process of development. In June, 1923, the directors of the Southern Railway Company prepared a statement explaining in detail the organization for conducting the business of the undertaking. As thus set forth the following departments were specified: Executive, Secretarial, Legal, Accounting, Estate, Rating, Operating, Commercial, Civil Engineering,

Locomotive, Carriage and Wagon Construction and Maintenance, Docks and Marine, Electrical Engineering, Purchasing and Supervising of Horses, Purchase of Stores and Storekeeping, Medical, Police.

Principal Departments.—The organization of the executive department provides, under the General Manager, for an Assistant General Manager, one or more Assistants to the General Manager as may be necessary, one or more Assistants for Staff Control, and an Assistant for the Issue of Passes (includes privilege tickets, &c., with certain specified exceptions). Under the Secretary are Assistant Secretaries as found necessary; the Transfer Department under the Registrar; the Savings Bank, Superannuation, and other Funds Department under a Controller; and the Treasurer's Department, under a Treasurer, who is assisted by a Paymaster. The Legal Department is under the Solicitor, with Assistant Solicitors as necessary. The Accounting Department is supervised by a Chief Accountant, with two Chief Assistants. The Audit Accountant is generally associated with the Chief Accountant and the General Manager. The Estate Department is under an Estate Agent, with Assistant Estate Agents as necessary. The Rating Surveyor is responsible for all rating matters.

In the case of the Operating Department there is a Chief Operating Superintendent, a General Assistant, a Locomotive Running Assistant, an Assistant for Rules and Regulations, a Staff Assistant, an Assistant for Train Services, and District Operating Superintendents. The Commercial Department is under a Chief Commercial Manager, concerned chiefly with the commercial aspects of passenger, freight, parcels, and other traffic, but associated with the Chief Operating Superintendent in certain respects. The Chief Commercial Manager is assisted by an Outdoor Commercial Manager and an Indoor Commercial Manager (each with two assistants), seven Divisional Commercial Assistants, an Assistant for Continental Work, and a Staff and Statistical Assistant.

The Civil Engineering Department is under a Chief Engineer, a Deputy Chief Engineer, a Chief Assistant for Parliamentary and General Purposes, a Permanent Way Assistant, a New Works Assistant, an Assistant for Bridge and Roof Construction, an Assistant for Heating, Lighting, and Water, an Architectural Assistant, a Quantity Surveyor, an Assistant for Signals, an Assistant for Telegraphs and Telephones, with District Engineers as necessary. The Chief Mechanical Engineer is assisted by a Carriage and Wagon Superintendent, and Works Managers as necessary. He is also assisted by the Locomotive Running Superintendent attached to the Chief Operating Superintendent's Department in regard to the maintenance of locomotives at running sheds, and is associated to some extent with the Chief Engineer and the Electrical Engineer.

The Docks and Marine Manager is assisted by an Assistant for General Purposes, an Assistant Docks Manager for Southampton, an Engineering Assistant, a Mechanical and Marine Engineer, an Electrical Engineering Assistant, and District Marine Superintendents. The Electrical Engineering Department is under an Electrical Engineer and an Assistant Electrical

Engineer. Other officers are the Horse Superintendent, Stores Superintendent (assisted by a Deputy Stores Superintendent), a Chief Medical Officer (with an Assistant Medical Officer and an Ophthalmic Surgeon), and a Police Superintendent.

Not all of these officers have actually been appointed, but the scheme of organization provides for them as and when such appointments are deemed necessary or desirable.

Great Western Organization.—In the case of the Great Western Railway practically the old organization has been retained, the principal officers (with assistants who need not be set forth in detail here) being: General Manager, Secretary, Chief Goods Manager, Superintendent of the Line, Chief Accountant, Chief Mechanical Engineer, Chief Engineer, Chief Docks Manager, Marine Superintendent, Signal and Telegraph Engineer, Electrical Engineer, Stores Superintendent, Stationery Superintendent, Surveyor and Estate Agent, Superintendent of Road Transport, Chief Cashier, Registrar, Registrar of Deeds, Hotels and Refreshment Rooms Manager, Solicitor, and Medical Officers.

London Midland and Scottish Railway.—In the case of the London Midland and Scottish and London and North Eastern Railways essential changes have been made, which differ in many respects from each other and from the organizations of pre-grouping railways. On the former line there is a General Manager, with several responsible Assistants; also a Deputy General Manager for Scotland, with Assistants. Other chief officers are the Secretary, Solicitor, Chief General Superintendent, Assistant Chief General Superintendent, Divisional and other General Superintendents, and Superintendents of Motive Power, Publicity and Advertising, &c., with other special and general Assistants, District Officers, &c.; a Chief Goods Manager (with Assistants, Divisional Goods Managers, &c.; a Mineral Manager and Assistant Mineral Managers; a Chief Engineer, with New Works, Parliamentary, and Permanent Way Assistants and Divisional Engineers; a Chief Mechanical and Electrical Engineer, Deputy Chief Mechanical Engineer, Electrical Engineer, and Divisional Mechanical Engineers, Works Managers, &c.; a Carriage and Wagon Superintendent, with Outdoor Assistant, and Divisional Carriage Superintendents and Divisional Wagon Superintendents, and Works Managers; and Accountants, Audit Accountant, Land and Estate Agent, Rating Agent, Storekeepers, Steamship Managers, Hotel Managers, &c.

London and North Eastern Railway.—Still another class of organization is found on the London and North Eastern Railway. Here there is a head-quarters staff, including a Chief General Manager (with two Assistant General Managers, one for Staff matters); Joint Secretaries (with an Assistant Secretary); a Chief Legal Adviser, Solicitor, and Chief Assistant Solicitor; a Chief Accountant, Deputy Accountant, and Assistant Accountant; Registrar; Chief Mechanical Engineer, with Chief Assistant Mechanical Engineers, District Mechanical Engineers (for each section), Locomotive, Carriage and Wagon Works Managers, Electrical Engineer;

and Officers in charge of the principal sub-works and depots; a Chief Stores Superintendent, Assistant Stores Superintendent, and District Stores Superintendents; Advertising Manager; and other departments concerned with the system as a whole.

Under the Chief General Manager, however, there are three Divisional General Managers, in charge, respectively, of the southern, north-eastern, and Scottish areas, and under these are Assistant General Managers and other Assistants, together with Area or Divisional Accountants, Superintendents, Passenger Managers, Goods Managers, Engineers, Running Superintendents, &c. Further subdivision is made in regard to the respective departments, some of which are officered on a central and others on an area or divisional basis.

Tendencies of Organization.—Although the main features of the organizations of the respective companies have thus been outlined, it is necessary to bear in mind that they are actually more or less tentative, only those of the Southern and Great Western companies being of a substantially permanent character. In the former case the organization has been definitely formulated; in the latter, existing organization has been developed as required but is not radically altered. The London Midland and Scottish, and London and North Eastern organizations are, however, of an interim character, the final arrangements being in process of development. The general tendency in all cases is, however, fairly clearly indicated, and may be anticipated as follows:

1. General Manager or Chief and Divisional or Area General Managers.

2. Secretarial, legal, accountancy, land and estate, stores, hotel, steamship, and other departments for the whole system, with assistants as required for the work of the various divisions.

3. Mechanical and electrical engineering departments for the whole system, with assistants for the respective divisions or sections, tentatively allocated more or less according to the component lines, but organized so that eventually the chief officers will be responsible for the work of their departments throughout the system, while their divisional assistants will probably have eventual charge of divisional work arranged as found desirable instead of on the basis of the respective previously independent railways.

4. Engineering, signal, telegraph, telephone, docks, &c., departments under chief officers at head-quarters, with divisional and district officers for the respective sections, but for a time, at least, allocated approximately according to the old component systems, in that the scope of their work is more closely associated with the engineering methods of the individual lines, and does not extend, as in the case of other departments, so much beyond the old frontier points.

5. The operating and traffic working departments, under Divisional or Area General Managers or General Superintendents, will, however, be allocated on a traffic basis, and may be arranged quite irrespective of the old boundaries of ownership. The traffic divisions will, in fact, be allocated according to the divisions into which it is found desirable to divide the

actual system, traffic considerations only being considered, the old divisions disappearing entirely or being modified very greatly. Under the Divisional General Managers or General Superintendents will be the operating officers of various grades, including operating superintendents, running superintendents, &c., and with district officers as required.

6. Commercial Officers, Chief Goods Managers, Passenger Managers, Mineral Managers, &c., at head-quarters, possibly having independent status, or under Divisional General Managers or General Superintendents, with assistants for the respective divisions and sections of work, but all concerned mainly, if not exclusively, with commercial aspects and not with the actual working of traffic. In some instances the operation of large goods depots, &c., may be under the Goods Managers.

The Selection of Officials.—As the directors as a body do not in this country interfere directly in the management of their lines, but act rather as supervisors of the work done, their duty of selecting capable officials is a very important one, and is really the basis of the dividends earned. Obviously, the appointment of a first-class general manager is the key of the position, and an important qualification for such a post is the capacity to find able subordinates, inspiring them with *esprit de corps*, and binding them as far as possible to the interests of the undertaking. There are, of course, two views of the railway service, one of which regards it as a whole, and would encourage the free movement of officials from company to company; while the other thinks the best results for the shareholders can be obtained by careful promotion of promising members of the staff with a view to training them in the ways of that particular line, and making it worth their while to continue in its service. There is much to be said for both these views; but on balance it would seem natural that the company giving its best appointments to its own staff will secure a strong *esprit de corps*—the value of which in work of any kind is great—which can hardly be expected on systems where the staff feel that the policy of the directors favours the introduction of "new blood" from some other line whenever a good post falls vacant. Directors must, of course, only appoint thoroughly qualified men, and if they are not to be found on their own staff they must seek officials on other systems; but it should be the duty of the general manager and heads of departments to carefully look out for promising juniors, and to encourage and train them for posts of responsibility. Now that the four great groups have been constituted, it is obvious that the railway service will be on much broader lines than when the 120 companies absorbed into these four systems were separate organizations, and the tendency will be towards standardization and uniformity of administrative and operating methods.

The Railway Association.—The Railway Companies' Association is the nearest approach to a thoroughly representative body, so far as public questions are concerned, which the companies have formed. There were before the grouping forty-three member companies, and each elected a delegate or delegates to attend meetings, called as occasion required,

and especially to take action with respect to any bill in Parliament affecting the general interests. The following companies are now represented by their Chairmen, Deputy Chairmen, General Managers, and Solicitors; Great Western, London Midland and Scottish, London and North Eastern, Southern, Metropolitan, and Metropolitan District. The Midland Great Western Railway of Ireland is still nominally a member of the Association. The Association also arranged for deputations to wait on the Board of Trade, later the Ministry of Transport, or other authorities in regard to any matter of sufficient interest. It was, however, only an advisory body, and the companies did not necessarily act collectively through it, as shown in the case of the negotiations with the Board of Trade resulting in the formation of the Conciliation Boards in November, 1907, and in the revised Boards in 1911. Under the new conditions brought about by the Railways Act, 1921, the value of the Association as a representative of British railways should be increased.

The Clearing House.—The Railway Clearing House forms the natural centre, on neutral ground, for meetings of railway officials, and various conferences are periodically held here, the most important of which are the meetings of General Managers, Operating Superintendents, Goods Managers, Passenger Managers, &c. There are also conferences of other officials, not only in London, but at provincial centres, where the details of the general lines of policy adopted at the more important conferences are arranged. The great secret of the success of all these conferences is that there is thorough mutual confidence and respect, and it is completely understood that what is decided by the majority will be loyally carried out by all the members. With only four groups in place of 120 separate organizations it is obvious that the work of the Clearing House is modified considerably.

As now constituted, in view of the fact that 58 companies have been reduced to 4 amalgamated companies, with 16 other companies (which would have reduced the delegates to 20), each of the four great companies now has four delegates, total 32, the quorum being reduced from 10 to 6. When this change was approved by the Railways Amalgamation Tribunal, opportunity was also taken to allow dates and numbers of full meetings, previously fixed by statute, to be arranged at the discretion of members, with the proviso that there must never be less than two in each year.

CHAPTER II

Railways and Private Bill Legislation

Private Bills.—It is obvious that with practically only four groups of railways in place of the 120 companies existing before the war, there will be much less business in the Parliamentary Committee Rooms; new

private bill requirements will to a large extent be settled by arrangement and without the costly contests of former days. Moreover, the Ministry of Transport Act of 1919 and the Railways Act of 1921 permit certain works of a smaller character to be undertaken on the authority of the Ministry and without requiring Parliamentary sanction. Before dealing with the new position it may be useful to recall the procedure in regard to Railway Bills gradually developed, and some of the methods adopted by the two Houses for protecting the interests of the public and of the shareholders.

The Standing Orders set forth fully the particulars and plans which will be required, and the first stage in the procedure for bringing a private bill before Parliament is the giving of notice stating the objects of such intended application, such notice to be published in the months of October or November immediately preceding the application, in the *London*, *Edinburgh*, or *Dublin Gazette*, as the case may be, and in some newspaper published locally and circulating in the district affected by the bill. No publication under this order can be made after a date specified. In the case of a tramway or underground railway, notice has, under certain circumstances, to be posted for fourteen consecutive days, in the streets affected by the line, in October or November. Deposit of plans, books of reference, and sections, and copy of the *Gazette* notice have to be made before 30th November at the office of the Clerk of the Peace for every county, riding, or division in England or Ireland, or in the office of the principal Sheriff Clerk of every county in Scotland, and in the case of railway bills an ordnance map on the scale of 1 in. to a mile, with the line of railway delineated thereon, so as to show its general course and direction, copies being also deposited in the Private Bill Office, with the Ministry of Transport, and, in the case of the Metropolis, with the London County Council, and in all cases with the local authorities in whose districts the intended works are proposed to be constructed. By 15th December, where lands or houses are to be dealt with compulsorily, application has to be made to the owners, &c., inquiring whether they assent, dissent, or are neuter in respect of such application, and subsequently separate lists of the answers have to be deposited. Some other formalities have also to be complied with before 21st December, where certain classes of powers are asked for.

The bill, which must be drawn to show exactly the powers desired in the concession from Parliament, is deposited in Parliament by the company's Parliamentary agent on or before 17th December. Together with it is deposited the petition for the bill sealed by the company, and the petition and the bill are open to the inspection of all parties; and printed copies of the bill also are delivered therewith for the use of any member of the House or Parliamentary agent who may apply for the same. Printed copies of the bills are also delivered to the Treasury, and certain other public departments and local authorities, including road authorities. The next stage is the deposit by the promoters of 5 per cent on the amount of the estimate of expense, this being required to secure that those pro-

moting the bills have some chance of carrying the work through if they secure their Act. In the case of existing railway companies, the shareholders are protected by the Standing Orders requiring that all the bills introduced by their directors must be submitted to them for their approval at a special meeting called for the purpose, such meetings being known as Wharncliffe meetings, after Lord Wharncliffe, who established the rule.

The above and many other formalities prescribed by the Standing Orders are designed to give the public, the Government departments, the local authorities, and private individuals affected notice of the powers sought. An examiner of Standing Orders is appointed by Parliament to make inquiry—commencing on or about 18th January—that the Standing Orders have been observed, and he reports compliance or non-compliance with Standing Orders. If non-compliance is reported, it is dealt with by the Committees on Standing Orders, who report whether or not the default should be excused and the bill allowed to proceed.

On or before 28th January, the Chairman of the Committee of Ways and Means of the House of Commons and the Chairman of Committees of the House of Lords meet, and decide in which House the bills deposited shall be first considered. They are advised respectively by the Speaker's counsel and the Lord-Chairman's counsel, whose duty it is to review the progress of all private bills, and who report to their respective Chairmen any points in the measures to which they think attention should be specially drawn. The bills being thus divided between the two Houses of Parliament, they are read a first time in the House of Lords or Commons as the case may be, this being a purely formal matter, and a second time, when the principles involved may be discussed. Of late years there has been a tendency on the part of some irresponsible members of the House of Commons to add, on occasions, at this stage, instructions to the committee to which a particular bill is referred; but the practice, except where very important principles are involved, is not favoured by the majority of members, and the committees concerned do not usually receive such instructions with enthusiasm, regarding them as in the nature of slights on their abilities to deal fully with all the questions involved. During the month of February parties wishing to be heard against the private bill must deposit their petitions in Parliament, stating precisely their objections, and taking care to disclose sufficient grounds or *locus standi* to be heard. In the House of Commons a Court of Referees, consisting of the Chairman of Committees, the Deputy-Chairman, and not fewer than seven members of the House, is established, which decides upon all petitions against private bills, and as to the rights of the petitioners to be heard upon such petitions. In the House of Commons also " The Committee of Selection " and " The General Committee on Railway and Canal Bills " arrange the bills in groups, order the constitution of the various committees to which the private bills are referred, appoint the chairmen, and the dates of the first sittings. Unopposed bills are dealt with by a committee especially appointed for the purpose, and presided over by the Chairman of Ways and Means. In

the House of Lords the procedure for setting up committees is administered principally by the Lord-Chairman of Committees.

The committees on railway bills in the House of Lords are composed of five peers, or in the case of the House of Commons of four members and a referee, or four members *not locally or otherwise interested* in the bills referred to them, this qualification being very carefully obeyed. Each member, before he is entitled to attend and vote, signs the following declaration: " I do hereby declare that my constituents have no local interest, and that I have no personal interest, in such bill; and that I will never vote on any question which may arise without having duly heard and attended to the evidence relating thereto ". All petitions against private bills originating in the House of Commons have to be lodged by a specified date, and in the case of bills originating in the Lords, the last day for petitions is also specified, and the Standing Orders clearly define the grounds on which *locus standi*, in certain cases, will be granted, the procedure to be followed by the committees in their work, and numerous particulars which have to be complied with by the various classes of bills in order that the interests of the public may be carefully guarded. The committees on opposed bills, having heard witnesses and counsel for and against the measures, declare that the preambles are, or are not, proved, and they report accordingly to their respective Houses. If the preamble is not proved, the bill is dead for that session; if it is passed, it comes up for third reading in the House in which it originated, and, having passed that ordeal, it is remitted to the other House, where it goes through exactly the same formalities of first and second reading, reference to committee, and third reading, in due course receiving the Royal Assent, when it becomes a statute of the country, and law on a date specified.

In the case of bills passed by the committee of the House of Commons there is an intervening stage between the reports of the committee to the House and the third reading, which is known as the Consideration of Report from the committee, when discussion not infrequently takes place on the action of the committee in passing the bill, and on the amendments they have made, or refused to make, which is often as important as the discussion on the second reading of the bill.

The progress of a private bill through Parliament occupies from six to twelve months, and is strictly regulated by the elaborate Code of Standing Orders before referred to, these Standing Orders having been made and modified from time to time as experience showed that the Private Bill Procedure required to be altered to give Parliament full opportunity to consider the bills and decide between the many conflicting interests which are aroused by their promotion. For instance, between the first and second reading there must be three clear days, and between the second reading and the sitting of the committee to which the bill is referred six clear days. The report of the committee, having been drawn up, is laid upon the table, and three clear days must intervene before the consideration by the House of the report of the committee, and one further clear

day's interval before the bill is read a third time. No private bill can pass through two stages on the same day without the special leave of the House. In practice, if the bill provokes much opposition these intervals are greatly extended.

The above particulars of the procedure in private-bill legislation give but an outline of the methods by which public and private interests are protected, the full details covering many pages of the Standing Orders, the interpretation and application of which is the special province of a Parliamentary agent. The smooth progress of a private bill depends greatly on the intelligent anticipation of opposition, and the skill displayed by the Parliamentary agent in avoiding pitfalls laid for him by an opponent. Although the system is in some cases expensive, there can be no suspicion of unfair dealing or corruption of officials or members of the committees at any stage, and the records of the work done in the committee rooms are unsullied by the stains of jobbery which have been a feature of similar work in some other countries.

Under the Private Legislation Procedure (Scotland) Act, 1899, it was provided that when the directors of a railway company desire to obtain Parliamentary powers in regard to any matter affecting public or private interests in Scotland, for which they are entitled to apply to Parliament by a petition for leave to bring in a private bill, they shall proceed by presenting a petition to the Secretary for Scotland, praying him to issue a Provisional Order, and, subject to certain conditions, the inquiry, instead of being held at Westminster, is held in Scotland before a tribunal formed by the Act. This procedure was designed with the intention of saving the expense of bringing the officials and witnesses of the companies concerned to Westminster in small matters, but where the application involves large interests, such as an important competitive line of railway, Parliament assumes control, and the Provisional Order is directed to proceed as a bill.

Effects of Grouping and New Railways.—To what extent grouping will influence or retard the construction of new railways is naturally an exceedingly difficult question to answer. In many instances, undoubtedly, the fact that the resources of a great company are now available for the purposes of extensions and improvements on sections which previously belonged to a company which could not afford to undertake them—and a number of such works are already in hand or contemplated—is altogether to the good. On the other hand, the fact that the premises and lines of one component company can now be utilized to meet the needs at the same place of another component company within the same group, and the benefits claimed for grouping, in that hitherto competitive routes and alternative depots and stations are at the disposal of the same management, will certainly deter a certain amount of new work which probably would have been undertaken under former conditions. On the whole, however, while Parliamentary work may be reduced, in that a single bill will often cover requirements which previously would have necessitated two, three, or more

separate bills, it does not follow that the new works to be undertaken will be less than formerly, and there will probably be other works which otherwise would not have been put in hand at all.

Position in regard to Irish Railways.—With the establishment of the Irish Free State the railways in the territory assigned passed under the control of that State. As regards the railways in Northern Ireland, some points in regard to Private Bill legislation may have to be settled. Thus in June, 1923, a curious situation arose in regard to the Londonderry and Lough Swilly Railway Bill, a private measure, the petition of the promoters being the subject of a special report from the Select Committee on Standing Orders of the House of Commons. The Committee entertained grave doubts as to whether it was competent for the promoters, a company domiciled in Northern Ireland, to apply for a Private Bill in the House of Commons if the subject matter of the Bill related to Ireland, and therefore they decided to make the special report and to ask for directions from the House.

The special report stated that the Bill had been referred to the examiners, who reported that " they feel doubts as to the due construction of the Standing Orders in their application to the petition for the Londonderry and Lough Swilly Railway Bill, inasmuch as the Bill applies to the Irish Free State and Northern Ireland, and they are unable to find any instructions in the Standing Orders directing them to deal with such a case."

An amalgamation Bill for railways in the Irish Free State was brought forward in April, 1924. This covers all railways other than the Great Northern, except certain small lines in the Free State, and lines partly in Ulster and partly in the Free State. In July, 1924, the Bill had been passed by the Dail and had reached the report stage in the Senate, and in August, 1924, the required preliminary meetings were held for amalgamating the various companies in groups, thus leading up to the full amalgamations prescribed by the Act which had by that time become law.

CHAPTER III

The Railway and Canal Commission and Board of Trade

For those who wish to understand many points in the British railway system of to-day it is necessary to have some knowledge of the social conditions of England at the time when the " iron horse " was first thought of as a rival to the horse of flesh and blood, as those social conditions had, unfortunately, very important influences in deciding lines of policy vitally affecting railway development in this country. The foregoing part of this volume has briefly described how the agricultural interests—then

all-powerful in Parliament—opposed the introduction of railways, the restrictions they imposed, and the conditions they forced on promoters of railways, which have had serious effects on the whole subsequent history of British railways. The late Dr. Smiles, whose *Life of George Stephenson* must always be the textbook for this period of British railway history, was unusually well qualified to be the historian of the early days of our railways, for, added to his marvellous industry in collecting, and his excellent judgment in selecting facts bearing on any subject on which he wrote, he had a charming literary style, and as secretary of the Leeds and Thirsk Railway (absorbed by the North-Eastern), 1845–54, and South-Eastern, 1854–66, he was behind the scenes at an early date in railway enterprise. As supplementary to this work, so far as the social conditions of England in those days are concerned, may be recommended some of George Eliot's earlier works, and Stanley Weyman's powerful novel, *Chippinge*, which bring out clearly how predominating were the landed interests before the Reform Bill was passed—in spite of the awakening of industrial activity in the North and Midlands—and how little the country generally understood the conditions required for the development of the great industrial enterprise which was to have such vast and far-reaching effects on the national life. Assuming that our readers are, or will make themselves, familiar with the historical sketch already given, let us try to briefly indicate the main lines of policy adopted by Parliament in regard to railways, and the procedure which has grown up in regard to railway matters dealt with in the two Houses and their committee rooms.

Parliament and Private Bills.—Before the passing of the Companies Act of 1862 revolutionized industrial and financial conditions in this country, every enterprise affecting public interests on a large scale had to receive Parliamentary sanction, and the history of private bill legislation dates back to the earliest Parliamentary records. Powers sought by private bills have always been jealously watched at Westminster. Thus from very early days there are records of private-bill legislation affecting sea fisheries, river weirs and fishing, highways, turnpikes, ports, havens, and river navigation, water supply, land reclamation, and docks, the earliest basins at Liverpool and other ports being built under statutory powers. Canals, too, were constructed under private Acts powers, and the records of the contests over the Bridgewater Canal bills in 1761–2 are very interesting reading. The success of this undertaking—now merged in the Manchester Ship Canal's system—led to the introduction of many other canal enterprises, the promoters of all of which came to Parliament for incorporation. Some of these old canal Acts, it is interesting to recall, authorized the construction of railroads as feeders to their systems, to facilitate the haulage, by horses, of goods to and from the boats.

The Earliest Railway Acts.—In the year 1801 the first railroad Bill pure and simple was introduced into Parliament.[1] This was a measure

[1] Much interesting reading on the above subjects will be found in Clifford's *History of Private Bill Legislation* (Butterworth).

to incorporate the Surrey Iron Railway Company, the promoters asking for powers to build a railway from Wandsworth to Croydon, with a branch to Carshalton, for "the advantage of conveying coals, corn, and all goods and merchandise to and from the metropolis". A line from Croydon to Reigate, with a branch from Merstham to Godstone Green, was authorized two years later. Then in 1804 came the line from Swansea to Oystermouth, followed by Acts secured by "iron railway" companies. These schemes, of course, only covered haulage by animal power. The Act of 1801 is, however, the only one of which special mention need be here made, for this statute formed the basis on which early legislation was

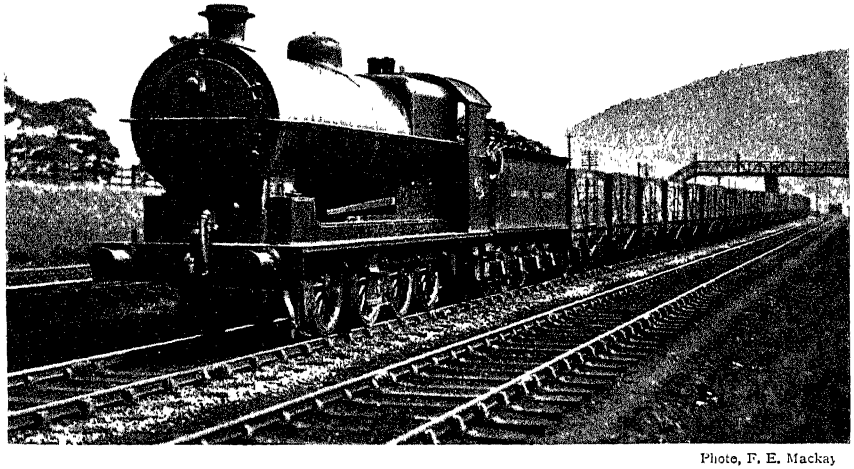
Photo, F. E. Mackay

Fig. 1.—Express Goods Train on Caledonian Section, L. M. & S. Railway

established. It followed the lines of the Canal Acts, and its roads were, like canals, meant for carriers and traders to use with their own vehicles. These early railways had no rolling stock of their own. All their owners did was to provide the tracks and take tolls within certain maximum rates. No passenger traffic was anticipated. How little sympathy the idea of the "iron horse" at first received from the public is sufficiently indicated in the following well-known extract from *The Quarterly Review* of March, 1825: "As to those persons who speculate on making railways general throughout the kingdom, and superseding all the canals, all the wagons, mail and stage coaches, postchaises, and, in short, every other mode of conveyance by land and by water, we deem them and their visionary schemes unworthy of notice".

The Railway and Canal Commission.—In granting powers to companies to construct the railways authorized, and to charge rates and fares

within the *maxima* sanctioned, Parliament has always retained effective rights of control to prevent unfair and oppressive use being made of the privileges secured by these undertakings, and has from time to time adopted measures to extend that control. Thus, under the Railway and Canal Traffic Act of 1854, framed on the recommendations of Mr. Cardwell's Committee, railway companies were treated by the State as parts of one general system, and were required to give proper facilities for the interchange of traffic and through booking without undue preference, through rates being enforced by the Act of 1873. Under the Act of 1854 also, to the Court of Common Pleas, the Scottish Court of Session, and to the



Photo, F. E. Mackay

Fig. 2.—Mineral Train near Mytholmroyd, Lancashire and Yorkshire Section, L. M. & S. Railway

Irish Superior Courts, was given a discretionary jurisdiction over railways, which was not, however, found, in practice, to work quite satisfactorily, as evidence could only be given on affidavit. Indeed, the whole Act failed to fully carry out the objects of those who framed it, and by the Railway and Canal Traffic Act of 1873 a Railway Commission was established, to which the powers given to the courts above mentioned were transferred, and which was empowered to consider complaints under the constituting Act and under the 1854 Act. This tribunal was superseded by the Railway and Canal Commission, established under an Act of 1888, which governs the powers and jurisdiction of the court as it exists at present.

The Constitution of the Commission.—The Commission consisted originally of two members appointed by the king on the recommendation of the President of the Board of Trade, and three ex-officio commissioners, "who must be judges of the Superior Courts", nominated one for England,

one for Scotland, and one for Ireland. Slight modifications have since been made, in view of the fact that the Ministry of Transport has succeeded the Board of Trade, while in view of the altered Irish situation there are now two judicial members only, one for England and one for Scotland. To the 1888 Commission were transferred all the jurisdiction and powers of the 1854 and 1873 commissioners, and, in addition, many fresh powers widely extending their usefulness. No appeal lies from a decision of the commissioners on questions of fact; but on points of law the dissatisfied party can appeal to the Court of Appeal, the judgment of this court being final except under certain conditions not likely to arise.

It would take too much space to enumerate all the powers held by the Railway and Canal Commission, but their importance may be judged from the fact that they covered such matters as—

The granting of reasonable facilities to traders;
Undue preference;
Through rates;
The acting as arbitrators between railway companies, and between railway and canal companies;
Working agreements between railway companies;
The keeping of rate-books;
Terminal charges;
The management of canals by railway companies;
Facilities under the Cheap Trains Act, 1883;
And many other points affecting traders and the travelling public.

The main idea of those who brought about the establishment of the 1873 and 1888 Commissions was to give the public a tribunal where complaints against railway companies could be dealt with on somewhat broader and more liberal lines than was possible in the law courts. Another important object aimed at was the establishment of a court in which the costs would be substantially lower than in the High Court, so that complaints might be freely brought by all who felt themselves aggrieved. Both these objects have been attained; the commissioners have always acted with the strictest impartiality; they have dealt with all cases brought before them on the broadest possible lines, and the costs of applicants, so far as the commission can control them, have been thoroughly reasonable. Of course, if litigants employ very eminent counsel, costs are incurred which no tribunal can control.

In general the Commission is still organized as above indicated. To some extent, however, its functions are modified by the work of the Railway Rates Tribunal of the Ministry of Transport, as explained more fully later.

To meet the convenience of complainants the commissioners are empowered to hold their sittings in any part of Great Britain or Northern Ireland. In these various ways Parliament has endeavoured to make it as easy as possible for complainants to obtain the decision of the Commission upon

their complaints, but these facilities do not appear to be very well known.

The Commission and the Railway Rates Tribunal.—In a paper read before the Institute of Transport in January, 1922, on "Transport Law", Sir Frances Dunnell, then secretary and solicitor of the North-Eastern Railway, now part of the London and North Eastern Railway system, pointed out that the Railways Act of 1921 does not abolish the Railway and Canal Commission, and, indeed, somewhat extends its functions in the hearing of applications under Section 16 as to railway services and facilities, but it establishes a new Court of Record by the name of the Railway Rates Tribunal, to which is wholly transferred the jurisdiction hitherto exercised by the Commission over rates and charges. It remains to be seen whether or not two Courts of Record, each having a peculiar jurisdiction in railway matters, can exist side by side as part of the established judicial system of the country. Traders as a body have never disguised their preference for a business as opposed to a legal tribunal, and the later appointments of commissioners by the Government have not altogether met with the approval of traders, as they have tended to eliminate the business element and to make the Commission a tribunal of lawyers. If the Rates Tribunal satisfies the requirements of the commercial community, it will be interesting to see how far the Commission will eventually be entirely superseded. The powers and duties of this tribunal are extensive.

The Board of Trade.—In Vol. II, p. 254, it is explained that the powers and duties of the Board of Trade in relation to railways have been transferred to the Ministry of Transport. It is necessary, however, to recall the leading points of the work done by the Board of Trade before such transfer, more especially in view of the fact that, apart from the special duties of the Ministry of Transport, most of the ordinary responsibilities of the Board of Trade still apply, but in regard to the Ministry in place of the Board.

The Board of Trade was somewhat peculiarly constituted, in that its constitution, which dates from the year 1786, when a committee of council was created "for the consideration of all matters relating to trade and foreign plantations", included the following appointed members:—The Archbishop of Canterbury, the First Lord of the Treasury, the First Lord of the Admiralty, the principal Secretaries of State, the Chancellor of the Exchequer, the Speaker of the House of Commons; such Privy Councillors as hold any of the following offices, viz. The Chancellor of the Duchy of Lancaster, the Treasurer of the Navy, the Master of the Mint, and also the Speaker of the Irish House of Commons, such holders of office in Ireland as are Privy Councillors in England, ten other members specified by name; at the same time a president and vice-president were appointed. This body, it is understood, never met, and the responsibility for the conduct of its business rested upon the president, while the situation to-day would not be in accordance with the constitution thus outlined, at any rate so far as Ireland is concerned.

Duties of the Railway Department of the Board of Trade.—In 1904 a committee appointed to consider the position and duties of the Board of Trade and of the Local Government Board made certain recommendations, which did not, however, affect the relations existing between the departments and railway companies. The railway department of the Board of Trade, under the direct control of the president, who was always a member of the Cabinet, consisted of an assistant and a junior secretary and a staff of four inspecting officers, two assistant inspecting officers, and three sub-inspectors, some of whom were working men before their appointments, whose duties it was to investigate the causes of accidents of sufficient importance to call for inquiry, and to make recommendations suggested thereby. There were also an electric adviser and an electrician and assistant. The Board's officials collected and published returns relating to the capital traffic and expenditure of the companies, and these statistics, with the secretary's reports thereon, were published with a promptitude which compared very favourably with that of similar returns compiled in other countries. In 1907 a new branch was established to deal with London traffic, but the work of the branch had been comparatively light, pending a wider treatment of the whole subject by Parliament.

The Board of Trade also supervised, under statutory powers, the companies' relations with their men, who were entitled to send to the Board confidential complaints of any ill-treatment from which they thought they suffered, as to the length of hours they worked.

It acted as intermediary between the companies and traders who complained of the rates charged to them.

It sanctioned all the by-laws issued by the companies for the regulation of their stations, &c.

Its officers inspected all new railways, and gave, or refused if necessary, permission for their opening for public traffic.

It assisted, when required, all committees on railway bills and other matters by advice and official returns.

It dealt with the provision of accommodation for the working classes under the Cheap Trains Act, and held inquiries on the subject when necessary.

It considered provisional orders made by the Light Railway Commissions.

From the above condensed summary of the principal powers exercised by the Board of Trade in regard to railways, it will be seen that the public interests were carefully guarded at Whitehall.

Speaking generally, all these powers are now exercised by the Ministry of Transport, together with other powers conferred by the Railways Act of 1921.

The Railway System of Great Britain.—From the preliminary Railway Returns for the year 1923, it appears that the total length of road (first track) open for traffic at 31st December of that year was 20,294 miles. Expressed as single track, the total mileage of running lines was 36,822

miles, and of sidings 14,960 miles. The total mileage of single track, including sidings, was thus 51,782 miles.

Capital expenditure stood at £1,181,200,000, and the total net income for 1923 was £52,400,000. The interest and dividends paid per cent of the receipts from capital were 4·4. In round figures the total traffic receipts were returned at £203,800,000, to which were added £2,100,000 miscellaneous receipts, making £205,900,000 total revenue receipts, with £166,100,000 total railway expenditure. Of the £205,900,000 receipts, £94,100,000 was contributed by coaching, £109,800,000 by goods services, and the balance from miscellaneous sources. Other items of the Returns follow:

Steam and electric locomotives [1]	24,220
Rail motor vehicles	100
Passenger-carrying vehicles	51,079
Other coaching vehicles	21,943
Merchandise, mineral, and railway service vehicles	713,976
Private owners' wagons (1918)	628,344
Passenger road motors	187
Passenger horse-drawn vehicles	72
Parcels and goods motor vehicles	2,099
Horse-wagons and carts	32,641
Passenger journeys [2]: First class	21,463,000
Second class	4,046,000
Third class	897,961,000
Workmen's	310,273,000
Total	1,233,743,000
Season Tickets (equivalent annual):	
First class	133,000
Second class	74,000
Third class	687,000
Total	894,000
General merchandise (tons)	58,773,000
Coal, coke, and patent fuel (tons)	222,239,000
Other minerals (tons)	61,983,000
Total (tons)	342,995,000
Live stock: Number	17,266,000
Train miles [3]: Coaching	251,669,000
Freight	143,114,000
Shunting coaching	16,980,000
Shunting freight	109,561,000
Engine miles: Other miles	58,328,000
Total	579,652,000

These statistics apply only to Great Britain. Separate returns are issued in respect of Northern Ireland and the Irish Free State, but owing to their overlapping and duplicating they cannot conveniently be dissociated.

[1] 40 electric.

[2] Originating statistics, and therefore counted once only in the case of composite journeys.

[3] Steam and electric standard gauge

	Southern.	Great Western.	London Midland and Scottish	London and North Eastern.
Mileage:				
First track (route length)	2,199	3,795	7,525	6,714
Single track (running lines)	4,197	6,351	14,118	11,988
Single track (sidings)	1,219	2,341	6,051	5,284
Single track total	5,416	8,692	20,169	17,272
Rolling stock:				
Locos., steam	2,258	3,944	10,292	7,385
Locos., electric	—	—	1	13
Departmental	6	—	50	15
Coaching vehicles, rail motor	10	53	28	12
Coaching vehicles, electric motor-cars	251	20	273	71
Coaching vehicles worked by steam power	6,959	6,655	19,005	13,837
Coaching vehicles, electric trailer cars	249	40	353	55
Total passenger-carrying vehicles	7,469	6,768	19,650	13,991
Other coaching vehicles	3,114	3,484	7,598	7,511
Merchandise and mineral vehicles	35,905	86,249	302,550	281,748
Railway service vehicles	2,522	9,619	22,933	17,365
Road vehicles	2,164	4,516	20,841	7,293
Horses	1,532	2,731	9,761	5,189
Steamboats owned: Number	38	17	74	46
Tonnage	23,211	6,971	32,020	20,535
Canals: Number	2 [1]	10	13 [1]	12
Length (miles)	3½	213	549	285
Docks, &c.: Length of quays (feet)	55,732	172,589	12,180	219,967
Hotels	10	8	36 [2]	32 [2]
Houses	8,064	3,636	25,581	18,339
Capital expenditure	£148,308,160	£167,805,054	£438,029,424	£338,788,139
Capital issued (with nominal additions)	110,374,819	103,414,659	297,138,106	251,311,577
Capital issued (without nominal additions)	106,631,082	109,258,395	293,281,010	216,169,819
Loans and debenture stock	39,012,378	35,927,107	101,791,069	109,486,815
Interest and dividends on capital	5,012,808	6,276,844	15,097,646	10,509,319

[1] One canal jointly owned. [2] One hotel jointly owned.

CHAPTER IV

Railway Accounts and Statistics

In June, 1906, a Departmental Committee was appointed to consider and report what changes, if any, were desirable in the form and scope of the accounts and statistical returns (capital, traffic, receipts, and expenditure) rendered by railway companies under the Railway Regulation Acts. By the courtesy of the Railway Companies' Association, the Committee had the advantage of having the form of accounts and statistical returns recommended by the Committee of Railway Accountants appointed by that Association to secure uniformity of practice among British railway companies in rendering their accounts. That Committee had sat for three years and had held over fifty meetings, and the result of its deliberations proved of great assistance, especially in revising the financial accounts.

The recommendations of the Departmental Committee,[1] so far as the forms of accounts and general statistics are concerned—omitting ton- and passenger-mile statistics, to which the companies' representatives offered strong objection—were embodied in a Bill which passed through the House of Commons in 1910. The dissolution of Parliament in November, 1910, prevented the measure coming before the House of Lords. However, the Bill was reintroduced in the session of 1911, and was duly passed into law.

Railway Companies (Accounts and Returns) Act.—This Act amended the law with respect to the accounts and returns of railway companies, and provided as follows:—

1.—(1) Every railway company shall annually prepare accounts and returns in accordance with the form set out in the first schedule to this Act, and shall submit their accounts to their auditors in that form.

(2) The accounts and returns shall be signed by the officer of the company responsible for the correctness of the accounts or returns, or any part thereof, and, in the case of an incorporated railway company, by the chairman or deputy chairman of the directors of the company, and shall be made up for the year ending the thirty-first day of December, or such other day as the Board of Trade may fix in the case of any company or class of companies to meet the special circumstances of that company or class of companies.

(3) Every railway company shall forward six copies of the accounts and returns to the Board of Trade not later than sixty days after the expiration of the year for which the accounts and returns are made up, and, in the case of an incorporated railway company, shall forward a copy of the accounts and returns to any shareholder or debenture holder of the Company who applies for a copy.

(4) If any railway company fails to prepare or forward, in accordance with this section, such accounts and returns as are thereby required, the company shall be liable on summary conviction to a fine not exceeding five pounds for every day during which the default continues.

[1] Included in their Report Cd., 4697, June, 1909.

(5) If any account or return prepared and forwarded under this section is false in any particular to the knowledge of any person who signs the account or return or any part thereof, that person shall be liable on conviction on indictment to imprisonment with or without hard labour for a term not exceeding one year, or to a fine not exceeding one hundred pounds, and on summary conviction to a fine not exceeding fifty pounds.

2.—(1) A copy of the accounts numbered 1 (*a*), 1 (*b*), 1 (*c*), 3, and 18 in Part I of the First Schedule to this Act, as forwarded to the Board of Trade in pursuance of this Act, shall be filed by the Registrar of Companies in England, and if any part of the railway of a company is situated in Scotland or Ireland, also by the Registrar of Companies in Scotland or Ireland, as the case may be, and for that purpose the Board of Trade shall, on receiving copies of accounts and returns under this Act from a railway company, furnish one of those copies to any Registrar by whom accounts are to be filed under this section.

(2) Any person may inspect the accounts filed by any Registrar of Companies in pursuance of this section on paying a fee of one shilling for each inspection as regards each railway company, and any person may require a copy or extract of any of those accounts to be certified by or on behalf of the Registrar on paying for the copy or extract such fee as the Board of Trade may appoint not exceeding sixpence for each folio of a certified copy or extract, or in Scotland for each sheet of two hundred words.

(3) The provisions of the Railway Companies Securities Act, 1866, requiring half-yearly accounts in connection with loan capital, shall cease to have effect, and in section fourteen of that Act (which relates to the declaration to be made on mortgage deeds and debenture stock certificates) "the officer responsible for the correctness of the declaration" shall be substituted for "the company's registered officer".

3.—(1) The Board of Trade may by order, made under this section, alter or add to the First Schedule to this Act in such manner as they think fit; and on any such alteration or addition being made, this Act shall be construed as if those alterations or additions were made in the First Schedule thereto.

(2) When the Board proposes to make any such alteration or addition, they shall publish in the London, Edinburgh, and Dublin Gazettes, notice of the proposal and of the place where copies of the proposed alterations or additions may be obtained, and of the time, not being less than one month, within which any objection or suggestion made with respect to the alterations or additions by or on behalf of persons affected must be lodged with the Board, and shall take such other steps as they think best adapted for giving information with respect to those matters to persons affected.

(3) The Board of Trade shall consider any objection or suggestion made by or on behalf of persons appearing to them to be affected, which is lodged within the required time, and give to any person lodging any such objection or suggestion an opportunity of communicating with the Board on the matter.

(4) Not less than one month and not more than three months after the expiration of the time within which objections must be lodged, notice may be given to the Board of Trade, by or on behalf of railway companies whose aggregate capital is not less than one-third of the total aggregate capital of all railway companies in the United Kingdom, that the companies are not satisfied with the mode in which any objection lodged by a railway company has been dealt with and in that case,

unless the notice is withdrawn, the order of the Board shall be provisional only, and shall not take effect unless it is confirmed by Parliament.

(5) The Board of Trade may submit to Parliament a Bill for confirming any order made by them which requires to be so confirmed, and if, while any such Bill is pending in either House of Parliament, a petition is presented against any order comprised therein, the Bill, so far as it relates to the order, shall be referred to a Select Committee, or, if the two Houses of Parliament think fit so to order, to a joint committee of those Houses, and the petitioner shall be allowed to appear and oppose as in the case of Private Bills.

(6) The Board of Trade shall (in addition to the powers given to them under the foregoing provisions of this section) have power on the application of any company, to make as respects that company any special variation in the form of the accounts and returns set out in the First Schedule to this Act which appears to the Board to be required for the purpose of adapting the form to the particular circumstances of that company.

4.—(1) A railway company shall not be under any obligation to prepare or to submit to their shareholders or auditors, statements of accounts or balance sheets, or to hold ordinary general meetings more than once a year, and anything which under any special Act is authorized or required to be done at a general meeting of a railway company to be held at any specified time may be done at the annual general meeting of the company at whatever time held:

Provided that nothing in this provision shall relieve a railway company of any obligation to prepare half-yearly accounts in cases where those accounts are required in connection with any guarantee of dividend under any such statutory provisions.

(2) The directors of an incorporated railway company may, if it appears to them that the profits of the company are sufficient, declare and pay an interim dividend for the first half of any year, notwithstanding that the accounts are not audited for the half-year and that a statement of accounts and balance sheet for the half-year is not submitted to the shareholders, and may close their register and books of transfer before the date on which the interim dividend is declared in the same manner and for the same time and subject to the same provisions as they may close their register or books before the date on which their ordinary dividend is declared or before the date of their ordinary meeting.

5. Nothing in this Act shall affect or limit any obligations imposed upon a railway company or any powers or rights conferred upon the Board of Trade by section nine of the Regulation of Railways Act, 1871, as amended by section thirty-two of the Railway and Canal Traffic Act, 1888, but the returns required of a railway company by those sections shall only be made at the instance of the Board of Trade and at such times as the Board of Trade may direct.

6.—(1) In this Act—

the expression "railway company" means any company or person working a railway under lease or otherwise, and the expression "railway" means a railway authorized by special Act;

the expression "special Act" includes any certificate or order having the force of an Act, and the expression "statutory provisions" includes the provisions of any such certificate or order;

the expression "Registrar of Companies" means the officer performing the duty of the registration of companies under the Companies (Consolidation) Act, 1908, in England, Scotland, or Ireland, as the case may be;

the expression " shareholder " means the holder of any share or part of any stock or other capital of a railway company which is not raised by means of borrowing or has not the character of borrowed money, and the expression " debenture holder " means the holder of any debenture or part of any debenture stock or other capital of a railway company which is raised by means of borrowing or has the character of borrowed money.

(2) Where any light railway company or other railway company are exempted by virtue of any special Act from the operation of sections nine and ten of the Regulation of Railways Act, 1871, as respects their railway or any part of their railway, that company shall, so far as regards that railway or part of the railway, be exempt from the obligation to prepare, submit, and forward accounts and returns under this Act; and the Board of Trade may exempt any company or authority from that obligation if they are satisfied that the business of a railway company is merely subsidiary to the main business carried on by the company or authority, and that the company or authority are under an obligation to prepare their accounts in a form prescribed by the Board of Trade or to present them to Parliament.

(3) Where a railway is being managed or worked by a joint committee or other body representing two or more railway companies and the receipts and expenditure of that railway are separately treated under Abstract J in the accounts and returns prepared and forwarded by the several companies whom the committee or body represents, the committee or body shall, for the purpose of the provisions of this Act with respect to accounts and returns, be deemed to be a separate railway company.

7.—(1) The Acts specified in the Second Schedule to this Act are hereby repealed to the extent mentioned in the third column of that Schedule.

(2) This Act shall be cited as the Railway Companies (Accounts and Returns) Act, 1911, and shall come into operation on the first day of January nineteen hundred and thirteen.

The Schedules gave the Forms for Financial Accounts and Statistical Returns.

The Board of Trade and the New Act.—The views of the Board of Trade in regard to the Railway Companies (Accounts and Returns) Act were submitted to the House of Commons by the President, on the motion for its Second Reading on 15th June, 1910; and the following extracts from his speech may be usefully placed on record with the copy of the measure given.

Mr. Sydney Buxton, the President of the Board of Trade, said that the Bill was an attempt to deal with a question which had created great interest in the last few years—the question of an improvement in the returns and accounts at present provided under Act of Parliament by railway companies. . . . It had of late years become more evident, from time to time, that the system of making returns and accounts by railway companies was antiquated, and there grew up a strong desire that the returns should be brought up to date. The present returns and accounts were furnished under Acts of Parliament the first of which was passed in 1868, being amended in 1871. They were passed at a period when the railway system in this country, and the methods of conducting the railways, were on a much smaller scale than at the present time. But the forms laid down for the accounts and

returns had become stereotyped by Act of Parliament, and no means were possessed by the Board of Trade for bringing them up to date. Consequently a year or two ago the Board of Trade appointed a Departmental Committee to go into the question of railway returns and accounts. . . .

The first point on which the Committee reported unanimously was that there was no advantage in the present system of railway companies being obliged to give their shareholders half-yearly returns and accounts, and they proposed that, for the future, it should be sufficient to have annual returns and accounts presented to the shareholders, these returns to be sent also to the Board of Trade, for publication if necessary. This recommendation was unanimously agreed to, and was embodied in this Bill There was a further and more important duty put upon the Committee, which was asked to report on the best method in which the existing returns and accounts should appear for the information of the shareholders and of the public, as well as of the Board of Trade, and they adopted certain forms both of accounts and statistics which are embodied in Part 1, so far as accounts are concerned, and in Part 2 as regards statistics, in the Schedule of the Bill. Mr. Buxton said that, taking into account the very careful consideration which was given to these returns and accounts by the members of the Committee, and that they came to a unanimous agreement with regard to them, he thought it right and best to have the weight of the Committee behind him, and had practically adopted the accounts and returns in the shape in which the Committee recommended them. . . .

Changes under the New Act.—"The nature of the changes which the Bill proposes", said Mr. Buxton, "is substantially this: Under the old statutory system of accounts there were no means of showing to the shareholders and the public the various nature of the enterprises of railway companies. There was nothing which kept distinct what I may call the accounts of the railways proper to their business as railways, and the accounts of their revenue and expenditure on account of other matters complementary to their railway undertakings. Of late years the railways of this country have largely extended what I may call the commercial part of their railway undertakings, and have become the proprietors of steamboats, canals, omnibuses, hotels, and last night it was arranged that they might become the proprietors of golf links. The Committee were unanimously of opinion that the revenue and expenditure on account of these extensions of their business ought to be distinguished and made clear from the revenue and expenditure on railway matters proper. It was thought that this was necessary with a view to the accuracy of the accounts, and so that those interested in the matter might see what was the expenditure on the working of the railways apart from these subsidiary matters. Under the old Acts—the Regulation of Railways Act, 1861, and that of 1878—they included, in one miscellaneous table, figures dealing with steamboats, canal and harbour expenses, and a variety of other matters; but we now propose that the schedules shall show separately the receipts and expenditure in respect of omnibuses and other vehicles run in connection with the railway, refreshment rooms, dining cars, steamboats, canals, hotels, and other enterprises. That will be of importance; but, apart from that, the returns and accounts show an extraordinary improvement in clearness and detail, both from the point of view of the public and the Department."

The Yearly Accounts.—The accounts of each year's working forwarded, with the report early each year, to the shareholders are divided into two sections.

SUMMARY OF FINANCIAL RESULTS SECURED

	1913	1914.	1915.	1916.	1917.	1918	1919.	1920.	1921	1922
	£	£	£	£	£	£	£	£	£	£
Total Expenditure on Capital Account (No. 4) ..	56,110,312	56,214,604	56,228,685	56,266,599	56,295,645	56,300,472	56,236,506	56,151,507	56,111,968	56,305,498
Gross Receipts from Businesses carried on by the Company (No. 8) ..	5,467,053	5,430,310	5,835,148	6,212,363	6,883,275	7,957,030	10,221,333	13,097,416	11,520,879	9,652,757
Revenue Expenditure on ditto (No. 8)	3,293,123	3,270,821	3,677,464	4,057,758	4,720,864	5,784,151	8,052,415	10,938,408	9,599,344	7,384,737
Net Receipts of ditto (No. 8)	2,173,930	2,159,489	2,157,684	2,154,605	2,162,411	2,172,878	2,168,918	2,159,008	2,096,535	2,268,020
Miscellaneous Receipts net (No. 8)	160,111	156,353	160,880	165,288	174,287	184,154	182,687	165,083	181,588	211,603
Total Net Income (No. 8)	2,334,041	2,315,842	2,318,564	2,319,893	2,336,698	2,357,032	2,351,605	2,324,091	2,278,123	2,479,623
General Interest	—	—	—	—	—	8,919	19,228	25,416	24,600	175,254
Interest, Rentals, and other Fixed Charges (No. 9) ..	903,151	919,504	915,466	934,055	918,372	901,862	903,540	905,183	883,869	890,204
Dividends on Guaranteed and Preference Stocks (No. 9)	772,883	772,883	772,883	772,883	772,883	772,883	772,883	772,883	772,883	772,883
Balance after Payment of Preference Dividends (No. 9)	658,007	623,455	630,215	612,955	645,444	691,206	694,411	671,441	645,971	991,790
Dividend on Ordinary Stock (No. 9)	646,311	623,229	623,229	623,229	646,311	692,476	692,476	669,394	646,311	992,549
Rate per cent ..	3½	3⅜	3⅜	3⅜	3½	3¾	3¾	3⅝	3½	5⅜
Surplus	11,696	226	6,987	—	—	—	1,935	2,047	—	—
Deficit	—	—	—	10,274	867	1,270	—	—	340	759
Appropriation to Reserve	—	—	—	—	—	—	—	—	—	—
Brought forward from previous years	10,385	22,081	22,307	29,294	19,020	18,153	16,882	18,816	20,863	20,523
Carried forward to subsequent years	22,081	22,307	29,294	19,020	18,153	16,882	18,816	20,863	20,523	19,764

Part I shows (accounts 1 to 7) the capital authorized, raised, and expended, with estimates of further expenditure; the revenue receipts and expenditure and proposed appropriation of net income of the whole undertaking and the interim dividends paid (8 to 9); receipts and expenditure in respect of railway working (10), with 9 abstracts giving details as to (A) maintenance and renewal of way and works; (B) maintenance and renewal of rolling stock; (C) locomotive running expenses; (D) traffic expenses; (E) general charges; (F) expenses of collection and delivery of parcels and goods; (G) running powers, receipts, and payments; (H) mileage demurrage and wagon hire; (J) jointly owned and jointly leased lines, receipts and expenditure. Accounts are then given dealing with receipts and expenditure in respect of omnibuses and other passenger vehicles not running on the railway; steamboats; canals; docks, harbours, and wharves; hotels and refreshment rooms and cars where catering is carried on by the company; separate businesses carried on by the company; and electric power and light. Section No. 1 closes with the General Balance Sheet. In connection with these accounts, and of special interest to the shareholders, may be mentioned the Summary of Financial Results secured, given after the Statistical Returns, of which the example on p. 109 from the last (1922) report of the Caledonian Company may be taken as typical.

Part II, giving the Statistical Returns called for, gives particulars as to:

Mileage of Lines—

(A) Mileage of Lines open for Traffic.
(B) Mileage of Lines authorized but not open for Traffic.
(C) Mileage of Lines run over by the Company's Engines.

Rolling Stock—

(A) Steam Locomotives and Tenders.
(B) Rail Motor Vehicles.
(C) Trains worked by Electric Power.
(D) Coaching Vehicles (other than Electric).
(E) Merchandise and Mineral Vehicles.
(F) Railway Service Vehicles, and Horses for Shunting.

Horses and Road Vehicles employed in the Collection and Delivery of Parcels and Goods, and in the Conveyance of Passengers.
Steamboats.
Canals.
Docks, Harbours, and Wharves.
Hotels.
Land, Property, &c., not forming part of the Railway or Stations.
Other Industries (if any).
Maintenance and Renewal of Way and Works (Abstract A).
Maintenance and Renewal of Rolling Stock (Abstract B).
Engine Mileage.
Passenger Traffic and Receipts.
Goods Traffic and Receipts.
(A).—Tonnage of the Principal Classes of Minerals and Merchandise carried by Goods Trains.
(B).—Number of Live Stock carried by Goods Trains.
Summary of Financial Results secured.

Certificates of the Responsible Officers as to the Upkeep of the whole of the Company's Property.
Auditors' Certificate.
Index.
Map.

Statistics and Returns.—Section 18 of the Ministry of Transport Act, 1919, provides that:

" For the period of two years after the passing of this Act it shall be the duty of the owners of any railway, light railway, tramway, canal, inland navigation, dock, harbour, or pier undertaking, and the authority or person liable to maintain any public highway or bridge, to furnish to the Minister, in such manner and form as he may direct, such accounts, statistics, and returns as he may require for the purpose of his powers and duties under this Act."

Section 77 of the Railways Act, 1921, provides:

(1) That the accounts to be rendered under the Railway Companies (Accounts and Returns) Act, 1911, shall be compiled in such manner as may be determined by the Railway Clearing House with the approval of the Minister of Transport, or, if the Minister is unable to approve the proposals of the Railway Clearing House, as may be determined by the Minister after reference to, and considering the report thereon by, a committee composed of not less than three or more than six persons nominated by the Railway Companies' Association, and not less than three or more than six expert and impartial persons of wide commercial and trading experience to be chosen by the Minister from the panel set up under section twenty-three of the Ministry of Transport Act, 1919, as extended by this Act.

(2) It shall be the duty of every railway company to compile and render to the Minister the statistics and returns set out in the Eighth Schedule to this Act, subdivided in the case of an amalgamated company in accordance with such operating areas as may be agreed between the Minister and the company, subject, nevertheless, to such variation of those statistics and returns as may from time to time be agreed between the Minister and the Railway Companies' Association Provided that the Minister may exempt any light railway company from the obligations imposed by this sub-section to such extent as he may think fit.

(3) In the event of non-compliance on the part of any railway company with any requirement of this section, the requirement shall be enforceable by order of the Railway and Canal Commission on the application of the Minister in any of the ways referred to in section three of the Railway and Canal Traffic Act, 1854, of section six of the Regulations of Railways Act, 1873.

(4) Nothing in this section shall be interpreted to authorize any limitation of or interference with the control of the proprietors of any undertaking over the purposes to which its expenditure is to be applied.

Section 84 provides:

(1) That railway companies in Ireland shall, until other provision is made by the Council of Ireland, compile and render such statistics and returns as are at the passing of this Act in pursuance of any statute agreement or otherwise being rendered by such companies.

(2) Save as aforesaid, the provisions of this Act shall not apply to railway companies in Ireland.

Schedule of Statistics (Railways Act, 1921) to be supplied by railway companies of Great Britain in addition to those furnished under Railway Companies (Accounts and Returns) Act, 1911.

1. Freight receipts, tons and ton-miles	Monthly.
2. Tons and receipts of selected commodities conveyed at freight-train rates	Monthly.
3. Commodity ton-miles	Monthly.
4. Passenger journeys and receipts	Monthly.
5. Passenger miles	Periodically.
6. Quantities and receipts of parcels and miscellaneous traffic conveyed at coaching-train rates	Monthly.
7. Train and engine miles and hours of company's engines over own and other systems	Monthly.
8. Train and engine miles and hours over company's system by own and other companies' engines	Monthly.
9. Locomotives in use	Monthly.
10. Loaded and empty wagon miles	Monthly.
11. Consumption of coal, electricity, and oil by locomotives	Monthly.
12. Construction and repair of rolling stock	Half-yearly.
13. Marshalling yard statistics	One month each half-year.
14. Census of staff, showing number of men in each grade at each rate of pay	Annually.
15. Tonnage conveyed on canals, separating principal commodities	Monthly.
16. Analysis of time spent by ships in port at railway owned docks.	
17. Tonnage dealt with and cost of working at selected goods depots	One month each half-year.
18. Tonnage carted and cost per ton at selected stations. Motor cost to be distinguished from horse cost	One month each half-year.
19. Capacity of wagon stock of various types	Annually.

Government Returns.—The Ministry of Transport issues full yearly returns relating to the Railways of Great Britain; also monthly statements giving Traffic Statistics. Separate returns are now issued for Northern Ireland and for the Irish Free State, but several railways have lines in both, so that it is only practicable to give the complete statistics in each, as it is impossible to dissociate the items. These returns are therefore largely duplicative and virtually useless for allocated statistical purposes.

CHAPTER V

Railway Employees

The Ministry of Transport in November, 1922, prepared a return showing the number of persons employed by the several railway companies of Great Britain during the week ended 25th March of that year,

from which the following figures are taken. The total employed was, it will be seen, 676,802, excluding the staff required for the Manchester Ship Canal Company's lines:

STAFF EMPLOYED BY RAILWAY COMPANIES OF GREAT BRITAIN DURING THE WEEK ENDED 25TH MARCH, 1922

Name of Company.	All Grades.
Alexandra (Newport and South Wales) Docks and Railway	1,677
Barry	3,788
Caledonian	26,080
Cambrian	2,238
Cardiff	2,585
Cheshire Lines Committee	4,898
Furness	2,982
Glasgow and South-Western	11,310
Glasgow, Barrhead, and Kilmarnock Joint / Glasgow and Paisley Joint, and Princes Docks	1,111
Great Central	31,456
Great Eastern	38,006
Great Northern	35,874
Great North of Scotland	3,082
Great Western	87,338
Highland	3,342
Hull and Barnsley	3,793
London and North-Western	133,940
London and South-Western	29,596
London, Brighton, and South Coast	16,972
London Electric	6,340
Metropolitan	3,895
Metropolitan and District	3,306
Midland	74,764
Midland and Great Northern Joint Committee	2,580
North British	29,518
North Eastern	59,270
North London	1,796
North Staffordshire	6,360
Rhymney	1,873
Somerset Joint Committee	1,628
South Eastern and Chatham Railway Managing Committee	24,737
Taff Vale	5,594
Railway Clearing House	3,496
Other Companies with a total staff of less than 1000 each	11,577
Grand Total	676,802

Obviously, these figures do not now apply, in that a large proportion of the companies concerned have been incorporated in the new grouped companies, but they are of interest for the purposes of record as showing this aspect of the pre-grouping situation.

For completeness the totals for the four group companies may be given as on 24th March, 1923, as follows:

Great Western	109,376
London Midland and Scottish	268,835
London and North Eastern	202,232
Southern	70,479

A companion table gives the classification according to grade:

STAFF EMPLOYED BY RAILWAY COMPANIES OF GREAT BRITAIN DURING THE WEEK ENDED 25TH MARCH, 1923, IN THE GRADES SPECIFIED

Grades.	March, 1923.
Capstanmen	1,864
Carters and vanguards	19,203
Carriage cleaners	7,936
Carriage and wagon examiners	4,887
Carriage and wagon oilers and greasers	2,287
Chainboys and slipper lads	25
Checkers	11,702
Clerks	84,854
Cranemen	2,120
Crossing keepers	3,087
Engine cleaners	12,765
Engine drivers and motormen	36,708
Firemen	36,698
Goods guards	16,576
Passenger guards	7,899
Inspectors	7,759
Labourers	37,462
Lampmen	1,820
Loaders and sheeters	5,069
Mechanics and artisans	107,195
Messengers	2,552
Number takers	2,820
Permanent way men	63,312
Pointsmen	390
Policemen	2,773
Police Inspectors	231
Porters: Goods	20,731
Passengers	27,701
Shunters	17,987
Shunt horse drivers	842
Signal fitters and telegraph wiremen	4,885
Signalmen	29,509
Signal box lads	796
Stationmasters, yard masters, &c.	7,683
Ticket collectors	5,462
Watchmen	892
Working foremen	1,450
Miscellaneous	83,846
Grand Total	681,778

War conditions brought railway wages to abnormal figures, and present (1924) rates of pay are still affected by war influences. It may be recorded here that in the House of Commons on 20th March, 1923, the Parliamentary

Secretary to the Ministry of Transport stated that the expenditure on salaries and wages by the railway companies in Great Britain in 1922 was approximately £117,000,000. On the basis of salaries and wages in force in August, 1920, the Ministry estimated that the expenditure was at the annual rate of approximately £154,000,000, and at the March, 1923, rates, of £111,000,000. The expenditure on salaries and wages for the year 1913 was approximately £47,000,000. In this connection the Railway Returns for 1922 show that for the twelve months the railways of Great Britain paid as interest and dividends £51,973,763, equal to an average of 4·62 per cent on the capital issued. Of this sum £17,550,975 was paid to holders of guaranteed and preference stocks, £22,048,872 to the holders of ordinary stocks, and £12,563,727 in respect of debentures, loans, &c. The holders of the last named are in the position of creditors rather than proprietors. It will therefore be seen that salaries and wages alone were in 1922 more than double the amounts paid in interest and dividends, and in 1920, when the latter figures would not differ greatly from those of 1922, the ratio was nearly three times. During 1923 these figures fell somewhat, but comparisons with pre-war years are still seriously disproportionate.

In November, 1918, the railway trade unions entered into an agreement under which wages were to be automatically reduced with the fall in the cost of living indicated by statistics, published in the *Labour Gazette*, in regard to retail prices of selected commodities. To date, substantial reductions have thus taken place, but wages are still much above pre-war levels. An important factor which has a great influence upon financial aspects of railway working is the eight-hour day, with its complications due to the guaranteed day, though a " spread-over " is now allowed to some extent, even where the specified minima have been reached.

The Advantages of the Railway Service.—The dangerous character of many branches of the railway service is, of course, obvious, but there are advantages, which certainly indicate that there is no lack of consideration for employees by railway directors and officials. One great advantage—one of the highest importance to the working classes—is the permanent character of railway work. The mechanics employed at the companies' manufacturing and repairing shops have, of course, to face the uncertainties of this class of work, but even in these departments activity is more regular than in similar outside industries, whilst for those who enter the sections more immediately concerned with the movement of traffic—the railway business—it may be taken that there will be more regular work than in any other industry.

Although there is now a greater degree of uncertainty of employment, particularly in the more " casual " grades, the railway service is still regarded very highly in respect of permanency of employment and regularity of income and the other advantages of the railway service. The best test of the popularity of the service is to be found in the fact that, dealing with the wages staff, there are many cases in which the same family take service with a company from generation to generation. There have been cases

where the same family from the great-grandfather down to the great-grandson have served with one company. At one city alone, and it is only typical, where other means of employment abound, there were twenty-one instances of three generations and 286 cases of two generations all working for the London and North Western Railway on their wages staff. This shows that, having taken service with the company, and with a full knowledge of all its conditions, many of the servants are anxious for other members of their family to serve under the same employers. A very large propor-

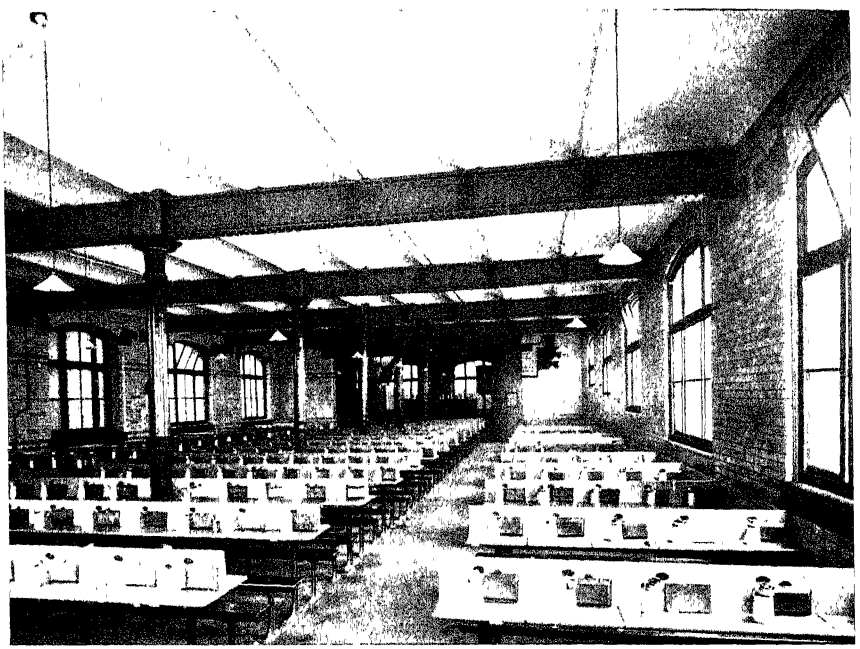


Fig. 3 —Dining Room for Workmen at Gateshead Institute, L. N. E Railway

tion of the subordinate officials, and some of those in the highest positions, rise from the ranks.

Free Uniform and Clothes.—The pecuniary advantages to the employees of the uniforms given free is a very important factor, seeing that, speaking generally, none of the uniform grades need incur any serious expenditure in regard to working clothes.

Pension and other Funds and Privileges.—Railway companies have supported societies for the benefit of their employees. The nature of these societies is indicated by such titles as "Accident Fund", "Sick Society", "Sick and Funeral Allowance Fund", "Friendly Society", "Insurance Society", &c. The organizations usually received substantial financial aid from the railways with which they were identified, such contributions being made from railway revenue. Full information as to these funds is given in the report of the Departmental Committee on Railway

Superannuation Funds. The Committee, which was appointed in May, 1908, made various recommendations as to actuarial valuations and other matters, but concluded that "uniformity of contributions and benefits appears under present conditions to be impracticable". With the passing of the Workmen's Compensation Acts and the National Insurance Act the need for some of these funds has passed away. Others have been continued as "approved" societies under the Insurance Act. Under grouping most of these organizations have been unified and systematized to meet the new conditions.

Superannuation Provision.—This class of help is intended for the salaried staff, including clerks. "Superannuation", as its derivation indicates, implies an age over and beyond what is looked upon or accepted as a normal or proper age for continuance of human effort towards acquiring a livelihood in ordinary lines of employment. Most of the large railway companies which have separate superannuation funds decided, at the request of the staff, to claim exemption, and most of them have satisfied the Insurance Commissioners that the terms of employment of their clerical staffs are such as to secure provision for sickness and disablement at least equal to that provided by the Insurance Act. Thus railway clerks do not have to contribute under the Act.

Savings Banks.—To encourage thrift amongst their employees, many of the railway companies have established savings banks for their men, which they assist in various substantial ways.

Houses and Free Gardens.—Many of the companies have provided comfortable sanitary cottages for their employees at centres convenient for their work, and let them at reasonable rents. On some lines, in fact, there are standard designs, often of an artistic and picturesque character, and there are instances where they form garden cities in miniature in the vicinity of country stations. Stationmasters' houses are generally attached directly to the station, others adjacent to the station approaches. Gatekeepers' cottages, and houses let to permanent-way men, may also be mentioned. Where houses are not available for staff generally provided therewith, monetary allowances are usually made. In a number of instances, particularly where depots and yards have been established in districts in which accommodation is not otherwise available, but also to assist employees to purchase houses of a good class on reasonable terms, estates have been laid out, either directly by the railway company or through a subsidiary concern established for the purpose. Thus the Great Western Railway established Public Utility Housing Societies in various districts, while on the London and North Eastern Railway a Cottage Homes Benefit Fund opened up several estates directly for the benefit of the staff. There are also loan schemes, building societies, and other arrangements of various kinds. The companies also provide gardens or allotments free, or let at nominal rents, where spare ground is available.

Ambulance Services.—The companies encourage in practical ways the training of the staff, through the St. John's and St. Andrew's Ambu-

lance Associations, in rendering first aid to the injured, and valuable services have been rendered by the men thus trained to their comrades and the public. Directors and high officials take every opportunity of showing their sincere interest in this work, and money and other prizes are given annually. Instruction is invariably free.

Safety First.—This movement has also received very strong support from railway companies, in respect of all grades, both on and off the lines. In a number of instances booklets have been issued showing the desirability of " safety first " in the interests both of persons directly concerned and of others who may be placed in danger through careless or thoughtless action. Pictures showing possible results are freely used, both in the booklets and on posters, while prizes and gratuities offered indicate recognition of good services rendered in emergency conditions or in acknowledgment of long periods of employment without accident.

Libraries, Reading Rooms, and Literary Institutes.—Railway directors and officials are always ready to encourage work in these directions. The institutes include, among other features, educational, literary, and physical departments, libraries, reading rooms, baths, billiards, ambulance classes, &c., and are supported by membership contributions, donations from the railways concerned, and outside sources; receipts from hall rents, concerts and other entertainments, fees for games, &c. Rifle clubs, horticultural and vegetable societies may also be mentioned, in addition to athletic associations, &c.; also hospital funds, and hospitals such as those at Crewe and Horwich.

Travelling Facilities for Railway Servants.—Then, again, it must be remembered that a certain number of free passes are granted to the servants of the companies, their wives and families, over their own lines, and in certain cases over the systems of other companies. Tickets at quarter fare are also issued, without restriction as to number, to servants and their families and certain other relatives, available over their own and other systems.

Educational Facilities.—Recognizing that while experience and practice count for a great deal, modern railway working is becoming " scientific " to an extent which calls for special training, railway companies have developed educational systems to meet their requirements. Most of these were in operation on all the greater systems before grouping, and the new companies have developed them still further on a unified basis. As a result, and in addition to the training schools and classes for enginemen, signalmen, &c., required to ensure their qualification for the work of their respective grades, there are signalling schools and classes in railway economics, operating, &c., available not only to the grades directly concerned, but to clerks and traffic men of all grades. These classes are usually held on railway premises, and facilities and encouragement for those attending are given, this applying also in respect of classes held at places like the London School of Economics, Manchester University, and other centres. The object is to encourage men of all grades to make themselves familiar

with operating methods, economics, &c., and thus to carry out their duties with an intelligent comprehension of what is involved outside their own immediate purview, with consequent advantage to the public, the company, and to the men concerned. The fact that railroading is a "science" is further developed by the encouragement given to debating and lecture societies and other associations of an educational character. The various staff magazines are also of practical use in this way. In fact, it is now realized by the more progressive and ambitious members of the staff that if a railwayman is to progress in his "profession" he must widen his outlook and must familiarize himself with matters extending far beyond the range of his immediate duties. Such an outlook must help to brighten what might without such an intelligent interest be classed as "monotonous" work.

Traffic Apprenticeship Schemes.—Developing further the ordinary educational facilities, most companies have instituted schemes designed directly for the training of future railway officers. Necessarily, it is only to a limited extent that an ordinary employee can become competent on a wide basis, and it is given only to the few to obtain the transfers from department to department and thus obtain practical experience in each. These schemes therefore provide, as a result of a severe competitive examination, or by recommendation, or both, for a course of training in various departments designed to give the special qualifications which railway operating on the large scale of the future will demand.

Staff Welfare.—The importance and value of welfare work, in securing a healthy, happy, and efficient staff, has been increasingly realized in later years, and all the great railway companies in some form or another have given attention to welfare measures, which have, generally speaking, been carried out through the ordinary departmental administration. Up to the present the London Midland and Scottish Railway has alone set up a special section of the General Manager's office, under the direction of a General Welfare Superintendent, to co-ordinate, initiate, develop, and assist all forms of welfare activity. Welfare supervisors, for male and female staff, have also been appointed in the main divisions of the line to assist the General Welfare Superintendent. The welfare staff is advisory and not executive, but can make recommendations to the General Manager and heads of departments on all matters appertaining to the welfare of the staff. The following indicate the scope covered by the department:

Internal Welfare (*i.e. during working hours*).

Conditions under which the staff work, e.g. accommodation, heating, lighting, ventilation, cleaning, &c.

Lavatory accommodation, sanitation, &c.

Canteens, messrooms, cloakrooms, and sick-rooms for women.

Accident prevention.

Ambulance work and equipment.

Medical and eyesight examinations; work of company's hospitals and doctors.

Training of apprentices and care of junior staff.
Education and training; arrangement of commercial classes and lectures, technical instruction, &c.

External Welfare (i.e during leisure hours).

Railway lodging houses.
Housing questions.
Assistance and advice in regard to institutes, athletic clubs, dining clubs, musical societies, and other recreational and social institutions; involving questions of lay-out, finance, land, buildings, equipment, &c.
Conduct of *L. M. S. Magazine*.

A General Manager's Message to his Staff.—As typical of the friendly relations encouraged between the officials and employees may be mentioned a folder issued in January, 1923, to members of the staff of the Great Western Railway. Over the signature of Sir Felix J. C. Pole, General Manager, the staff was addressed collectively. A foreword pointed out that the grouping of the thirty-three railways which, under the Railways Act, 1921, were to form the Great Western Railway of the future was then almost complete. "This grouping brings considerable additions to the large 'family' of Great Western Railway employees, and affords a fitting opportunity for a message to the 108,000 members of the staff whose well-being is bound up with that of this vast undertaking."

A few remarks followed, emphasizing the mutual interests of shareholders and employees, and pointing out that the Great Western Railway is the trustee of a vast investment, and that in no class of industry are employer and employed more dependent upon one another for the success of the undertaking than in the railway world. Under the heading of "Good Wages for Good Work", Sir Felix said that only the best is good enough for the Great Western Railway, and it is desired to continue to attract the best class of employees to its service. Commenting on "Pride of Service", and the need for "Peace and Harmony", he emphasized the necessity that "All must pull together on the same end of the rope". The valuable services rendered by the Railway Councils were then referred to. Under the heading "How You Can Help", it was explained that the staff could help in the following ways:

By giving a full day's work for a full day's pay.
By ensuring punctuality of trains.
By loading goods wagons to their capacity.
By confining shunting operations to a minimum.
By rigid economy of stores and materials.
By eliminating unnecessary wagon mileage.
By accelerating the movement of freight trains.
By handling goods with the utmost care.
By treating the travelling public and traders with every courtesy.
By securing passenger and goods traffic to their railway.
By adopting the "safety" habit.

By working together in peace and harmony.

By each employee, regardless of his position, taking a live interest in the undertaking.

The communication concluded with the remark that "The company is desirous of giving the very best service possible, and cordially invites the suggestions and constructive criticism of the staff to that end". Other sections of the folder referred to the work of the Great Western Railway as one of the pioneers of the staff educational movement, and the "safety" movement, first-aid and ambulance work, while members of the staff were invited to submit suggestions to the Suggestions Committee at head-quarters. On the back of the folder was a map of the Great Western Railway and its connections, with a collection of statistics relating to the constituent and subsidiary companies, together with a number of miscellaneous facts about the Great Western Railway, illustrated by five photographic reproductions.

The Railway Benevolent and other Charitable Institutions.—What other industry in the world can boast of a charitable institution of its own so generously supported by railway directors, officials, and shareholders, as the Railway Benevolent Institution, which is an addition to all the benefit funds of the various companies? This fund is managed by railway officials of the highest rank, who cordially give their time and zeal for the benefit of the men, and the public recognize this and liberally support the movement. The objects of the Institution are to grant permanent annuities, that are paid out of interest on invested capital, so that they may be always secure, from £10 to £30 to railway officers and servants when in distressed circumstances, and permanently incapacitated by old age, disease, or accident; to grant similar pensions to widows; and to maintain and educate orphan children between six and fifteen years of age. The children of railway officers are sent to private schools selected by their parents or guardians and approved of by the board of management, the expense of maintenance and education being defrayed by the Institution. The children of railway servants are provided for in the orphanage at Derby. Then it gives, either by gratuities or by contingent annuities, temporary assistance from time to time to all these classes, until permanent relief can be secured from the fund. From the casualty fund gratuities are granted to those who are injured in the performance of their duties, or to the widows of deceased members. Upwards of 210,000 men are members of this fund, which calls for a small qualifying subscription and an annual subscription of one shilling per annum. On the average 100 to 150 persons are relieved from this fund each week throughout the year. The Institution relieves by gratuities all applicants in distressed circumstances amongst officers and men, and their widows, orphans, and immediate dependents, whether subscribers to the Institution or not. Then there are very good pensions granted, because the funds of the Institution are sufficiently large to provide annuities.

In addition to the Railway Benevolent Institution, the staff have the

advantage of the benefits offered by the United Kingdom Railway Officers' and Servants' Association, the Railway Guards' Universal Friendly Society and Widows' and Orphans' Fund, the United Kingdom Railway Temperance Union Provident and Benefit Fund, the Convalescent Homes in various parts of the country, and the Railway Mission's Convalescent Homes, all supported by railway officials and directors.

The Institute of Transport.—This Institute may also be mentioned before concluding this chapter, though it is not restricted to railway employees, and is independent of any of the companies. With the establishment of a unified control of all the systems of transportation of the country under the Ministry of Transport, it was natural that an organization should be provided for bringing all these different interests together for mutual support and instruction. The first step in this direction was taken in 1919. The primary objects of the Institute are to promote and encourage knowledge of traffic science and of the art of transport in all its branches, and the means and appliances connected therewith; and to provide facilities for the study of, and the exchange of information and ideas on, traffic problems and all means and methods of transport, &c. Membership is classified as follows: members and associate members, non-corporate members, associates, graduates, and students. There is now a very large membership, including a majority of chief officers of leading railway companies and numerous assistant, divisional, and departmental officers, together with representatives of road, water, and aerial transport. Papers are read and discussed at the ordinary meetings, railway topics figuring prominently, while annual congresses at suitable centres include visits to places of interest, works, &c. Premiums are given for papers and other contributions. The Institute has formulated an examination course by which membership will, in future, be mainly recruited.

CHAPTER VI

The Light Railway Commission: now Transferred to the Ministry of Transport

Part V of the Railways Act, 1921, provides that the powers of the Light Railway Commissioners under the Light Railways Acts, 1896 and 1912, should be transferred to the Ministry of Transport as from 19th August, 1921, from which date it became the duty of the Ministry to administer the Light Railways Acts, and to deal with the making of Orders upon applications made thereunder, instead of, as before, merely with the confirmation of Orders made by the Commissioners. The Commissioners, whose powers and duties after 19th August, 1921, were confined to dealing with applications then before them, ceased to hold office on 19th February, 1922.

The establishment of the Light Railway Commission was brought about mainly with a view to helping the agricultural interests, and the late Lord (then Mr.) Bryce, the President of the Board of Trade, in a speech to the members of a large conference summoned by him to consider the subject, and which sat at the end of 1894 and the beginning of 1895, explained that the question had been forced on the Government owing to the depression in agricultural districts, and that it was hoped to relieve this depression by the introduction of cheap self-supporting railways in rural districts; but he went on to explain that it was also hoped to relieve the congestion in towns by providing cheap means of transit for workmen between town and suburbs, and to enable industries to be transferred to suburban or rural districts. The Act passed in 1896—the Bill having been introduced by the late Lord Ritchie, then President of the Board of Trade—covered electric tramways on public roads. Under this Act a public inquiry by the Commissioners in the district to be served by a proposed light railway was substituted for the cumbersome and expensive Parliamentary procedure described on a previous page, with supervision by the Board of Trade of the Commissioners' decisions. These inquiries have been held with strict impartiality, and the decisions have been regarded as justified by the actual facts in every case. The Commission consisted of a paid engineer and legal expert, and an unpaid chairman of high standing.

An important feature of the Act was that it empowered the State to grant financial assistance to a light railway on certain conditions. The Act of 1896, which applies only to Great Britain, was effective for five years, but since 1901 the Act has been extended, without opposition, by inclusion in the " Expiring Laws Continuance Act " each session.

Development Commissioners and Light Railways.—On 13th December, 1912, a Bill, introduced by the President of the Board of Trade, received the Royal Assent, extending the powers of the Commissioners for five years from the date of the passing of the Act. The Act increased the amount of special advances which could be made under the Act of 1896 from £250,000 to £750,000; empowered the Commissioners to consider applications for an advance from the Development and Road Improvement Funds Act, 1909, for the purpose of a Light Railway—the application and the report of the Light Railway Commissioners to be referred to the Development Commissioners; and amended the 1896 Act in some other directions. Existing railway companies have made some substantial use of the facilities offered by the Commission, as shown by a list of light railways promoted or taken over by large railway companies.

Looking back on the work of the Commission, it appears that, as so often happens in this country with new legislation, practice has not exactly followed the theory. Whilst Parliament established the Commission for the benefit of agriculture primarily, it crippled its powers of usefulness by placing practically prohibitive conditions on the State's financial help; and thus it has come about that whilst useful little lines have been

built where there were prospects of their paying as ordinary industrial ventures, schemes for opening out the poorest agricultural districts, where the railways would have been of the greatest service, have not been carried out.

Under the Development and Road Improvement Funds Act, 1909, the Commissioners could, subject to conditions specified, recommend the Treasury to make advances, for, amongst other objects, "the general improvement of rural transport (including the making of light railways but not including the construction or improvement of roads)", but it was further provided that "before making any recommendation for an advance for the purpose of the improvement of rural transport the Commissioners shall consult with the Road Board". Considering all the claims on the Funds which the Commissioners have had to meet, it is not surprising that there has been no widespread construction of light railways under the provisions of this Act.

The Work of the Commission.—In their final report, dated 18th February, 1922, the Commissioners recall that:

"The Light Railway Commission was established by the Act of 1896, in order that "local" lines of railway might be authorized and constructed at less cost than was then possible under Private Bill legislation, and under the Regulations applicable to the construction and working of statutory railways; the need was the more pressing in agricultural districts where long distances from markets and from existing railways, with the high cost of carting by road, constituted a serious drawback to production and to profit; further, at that time the application of electricity and of steam power was leading to a great extension of tramways, which in some important respects could be more adequately dealt with if promoted as light railways under the procedure of the Act of 1896 than under the Tramways Act, 1870.

"The devolution to an independent Commission, subject to the control of a Government Department, of powers and authority which previously had been reserved to the action and the decision of Parliament, was a novel experiment in constitutional practice, and accordingly was made terminable after a provisional period of five years; the procedure was, however, used to so great an extent that it was necessary to continue it, while the number, importance, and diversity of the applications made for Light Railway Orders demonstrated the widespread need throughout Great Britain for the improvement and organization of economical local transport.

"While the Act of 1896 and the procedure under it were thus justified, and a large number of Orders were made, the actual result in mileage of lines constructed was disproportionate and disappointing; this matter has been referred to from time to time in our Reports of past years, and the causes to which we attribute it have been indicated."

The following table, summarizing the results of all the applications made since 1896 to the Commissioners and to the Ministry up to 31st December, 1922, indicates the extent of the activities of promoters of light railways during this period:

	Applications Made.			Applications Granted.				Applications Rejected or Withdrawn.			Applications under Consideration		
	Number.	Mileage.	Engineers' Estimate for Construction.	Number.	Included in Orders.	Mileage.	Engineer's Estimate for Construction	Number.	Mileage.	Engineer's Estimate for Construction	Number.	Mileage.	Engineer's Estimate for Construction.
			£				£			£			£
Class A ..	280	295$\frac{56}{80}$	20,835,125	175	173	150$\frac{1}{2}$	10,398,893	87	129$\frac{5}{8}$	8,907,149	18	16$\frac{46}{80}$	1,529,083
Class B ..	288	202$\frac{1}{2}$	19,739,673	158	142	65$\frac{14}{80}$	6,465,796	129	137$\frac{56}{80}$	13,249,966	1	$\frac{1}{2}$	23,911
Class N ..	24	202	1,790,338	14	13	6$\frac{1}{8}$	742,053	8	13$\frac{1}{4}$	967,239	2	2$\frac{5}{8}$	81,046
Amending Orders	134	—	167,148	121	117	—	167,148	11	—	—	2	—	—
Total	726	518$\frac{16}{80}$	42,532,284	468	445	221$\frac{64}{80}$	17,773,890	235	280$\frac{56}{80}$	23,124,354	23	16$\frac{56}{80}$	1,634,040

Class A includes lines on lands acquired, mostly steam motive power
Class B includes lines on public roads, mostly electric motive power
Class N includes those lines which cannot be classified as Class A or Class B.

The Report continues:

"*Agricultural Traffic.*—So far as agricultural districts are concerned, while experience has disclosed more practical lines on which State aid in future may be applied under the Ministry of Transport Act, 1919, and under the Railways Act, 1921, to the exigencies of particular cases, the main ground of failure was in respect of finance, and the underlying weakness of finance has been chiefly attributable to one cause, viz., the relative scarcity of traffic for railway purposes. This scarcity is inseparable from the character of cultivation which obtain so largely; a pastoral district as such has neither the population nor the produce to bring upon a railway a remunerative traffic, unless augmented from other local sources or activities, such as quarries, forests, factories, &c. With reference to the vital national questions of productivity and cultivation this Report admits of one observation concerning railway traffic, viz., that for the heavy crops, such as potatoes, beetroot, &c., direct and close access to rails is essential, and that these crops are coming to be recognized as the pivot on which more extensive and productive cultivation in this country is likely to turn.

"In the remoter districts where traffic is light, the need for cheap transport facilities is none the less felt, but recent developments of mechanical transport on roads have gone some considerable way to meet it; in districts, however, where heavy traffic has to be moved and cost has to be reckoned with, the economical advantage of traction on rails will assert itself in any organized system of local transport, nor will any such system be complete that does not provide for and combine co-operating means of traction both by road and by rail; it may perhaps be added that no method of local transport which suffers from an undue competition between rail and road or admits of superfluous public services could be found economical in the long run.

"*Light Railways upon Roads.*—While it appears to have been anticipated that, following continental practice, light railways would to a large extent be laid upon or along public roads, this use of roads has in practice hitherto been almost confined in this country to lines of the overhead electric tramway type. The development of light railway systems of this kind has been considerable, and would, without doubt, have attained larger dimensions but for the objections of existing railway companies whose undertakings would have suffered from the abstraction of local passenger traffic, the procedure under the Light Railways Acts being ruled out in cases where such injurious affection was to be apprehended."

In dealing with proposals to lay rails on public roads, the Commissioners have carefully consulted the views and the claims of road authorities and of local authorities, having regard to the provisions of the Light Railways Acts, bearing in mind also the terms laid down in analogous cases under the Tramways Act, 1870, and by the Standing Orders of Parliament in that respect. While it has been represented that the conditions and restrictions which have been adopted accordingly may have tended to discourage the construction of such light railways by private enterprise, the Commissioners judged that their decisions must conform to the due rights and authority of public bodies charged with the control and maintenance of public roads.

The Outlook.—Amendments and variations have been effected by

the Light Railways Act, 1912, and by the Railways Act, 1921, which, based upon the experience gained in practice, will, the Commissioners' report states, " be likely to extend and improve the opportunities of constructing necessary light railways, and to facilitate the much needed organization of local transport in Great Britain; if such organization is thus brought under the control of an independent informed and permanent authority, the further advantages of continuity of policy and uniformity in practice would be preserved ".

CHAPTER VII

Irish Railways

With the establishment of the Irish Free State the railways in the territory handed over to the State passed under its control, the lines in the Irish counties remaining part of the United Kingdom coming under the control of the Northern Parliament. Early in 1922 the two Governments came to an agreement as between themselves and the railway trade unions as to the modification of what was known as the Carrigan Award dealing with wages and conditions of service, and it was proposed that a Joint Commission representative of both Governments should inquire into railway conditions generally throughout the country. Political differences, however, prevented joint action being taken, but both Governments carried out inquiries in 1922 with a view to settling policies for railway management and working. The Northern Commission's inquiry was limited to " railway undertakings in Northern Ireland ", whilst the Southern Commission covered all the railways in Ireland.

The report of the Railway Commission in Northern Ireland, issued on 9th December, 1922, showed that ten railway administrations, owning railways wholly or partly in Northern Ireland, work 1240 miles 56 chains of line; that the capital of the five railways wholly in Northern Ireland is £11,386,376, and of the railways partly in Northern Ireland is £7,342,393. After dealing with the various subjects covered by the inquiry, the report, signed by five, the majority, of the members, recommends that " the best means of working the railways of Northern Ireland in the future is by the continuance of the present well-established and competitive system of private management ". A minority report, signed by two members, recommends that the Northern Ireland Government accept the principle of public ownership for the railways and that the railways of the country should be treated as a whole and all be placed under National administration.

In November the majority report, signed by three of the four members of the Southern Government Commission, reported that there are in Ireland forty-six different railways, twenty-eight having a separate and distinct management, and eighteen worked by one or other of the twenty-

eight. The total capital upon which interest or dividend is payable is £46,853,324; the total route mileage is 3454, of which 2896 have the standard gauge of 5 ft. 3 in., and 558 miles have the narrow gauge, namely 3 ft. The report recommends State ownership with an independent Railway Board consisting of (1) a chairman, who should be a railway expert of wide managerial experience; (2) a representative of manufacturing industries; (3) a representative of trade and commerce; (4 and 5) two representatives of agriculture; (6 and 7) two representatives of labour; (8) a Government official to represent the Irish Treasury. The method of purchase proposed is to set up a tribunal to ascertain the cash value of £100 stock in each of the acquired undertakings. When so ascertained, the State to issue railway bonds to each stockholder for the amount so ascertained, bearing a reasonable rate of interest. The minority report, signed by one member, dissents from State purchase, and recommends unification of the railways in Free State territory with Government control and guarantee of 1921 dividends for a period of three years, under a Railway Board rather larger than that proposed in the majority report, and containing four representatives of railway shareholders.

Under the Irish Railways Act, 1924, practically all lines in the Irish Free State, except the Great Northern, have been amalgamated into the new Great Southern Railways.

RAILWAY RATING AND VALUATION

BY

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Railway Rating and Valuation

CHAPTER I

Historical Sketch

The rating of railways for the relief of the poor and other public purposes is governed by the Law of Rating as applied to all hereditaments. It is therefore necessary to refer briefly to the salient points of the history of the Law of Rating to obtain a comprehensive view of the subject.

Poor Relief in the Middle Ages.—In Saxon times, and up to the period of the break-down of the manorial system, which followed upon the heels of the Black Death, the relief of the poor was an obligation which devolved upon the lord of a manor, whether the King, bishop, monastic institution, or private person. Upon the decay of the manorial system Parliament enacted various laws dealing with the subject. Up to the time of Henry VIII the tendency was to endeavour to suppress begging rather than to afford relief, and then it was that the terms " rogue " and " vagabond " came to possess the sinister meaning now attached to them. However, by 22 Hen. VIII, c. 12, licences were allowed to beggars, and by 2 and 3 Philip and Mary, c. 5, a church rate for the poor was directed to be levied at Christmas-time. This was again strengthened by Acts 5 Eliz. c. 3, 18 Eliz. c. 3, and 39 Eliz. c. 3, the last of which empowered the churchwardens and four overseers of the poor (which office had been created by the Act 14 Eliz. c. 5) to set paupers to work and to raise weekly taxes from every inhabitant and occupier of land in the parish. This Act makes the parish the unit of rating, and appoints overseers for carrying out its provisions.

The principle of parochial assessment is that the inhabitants of every parish shall contribute to the relief of the poor according to their ability, and in pursuance of this idea the Statute of Elizabeth, as the Act 43 Eliz. c. 2 is usually termed, by Section 1 directed the overseers of every parish " to raise weekly or otherwise, by taxation of every inhabitant, parson, vicar and other, and of every occupier of lands houses tithes impropriate or propriations of tithes, coal mines or saleable underwoods, in the said parish

in such competent sum and sums of money as they shall think fit, a convenient stock of flax hemp wool thread iron and other necessary ware and stuff to set the poor on work; and also competent sums of money for and towards the necessary relief of the lame impotent old blind and such other among them being poor and not able to work, and also for the putting out of such children to be apprentices, to be gathered out of the same parish according to the ability of the same parish ".

The Statute of Elizabeth remains unrepealed and forms the groundwork of the existing Law of Rating. Since the passing of that statute in 1601 a large number of Acts dealing with rating have been enacted, e.g. in 1742, 1743 (2), 1801 (Section 8 of which provided that if a reduction is obtained on appeal the amount found to be overpaid must be refunded), 1814, 1820, and 1833, and in 1836 the Parochial Assessments Act (6 and 7 Will. 4, c. 96) was passed. That Act provided (Section 1) that no rate should be of any force " which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto; that is to say, of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenants' rates and taxes and tithe commutation rent charge, if any, and deducting therefrom the probable average cost of repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent ". This definition of rateable value still holds good.

Other Acts relating to the subject of Rating were placed on the Statute Book in 1837, 1840, 1843, 1848, 1849, and 1859, and in 1862 the Union Assessment Committee Act (25 and 26 Vic. c. 103) was passed appointing an assessment committee for each union of parishes. Section 15 of that Act defined gross estimated rental (for the first time) to be the rent " at which the hereditament might reasonably be expected to let from year to year free of all usual tenants' rates and taxes, and tithe commutation rent charge, if any ", thus repeating in part the definition of rateable value given in the Act of 1836. Two years later an amending Act was passed, and in 1869 the Act 32 and 33 Vic. c. 41, dealing with " compounding ", came into force. The same year the Valuation (Metropolis) Act was enacted, and will be dealt with later. The Rating Act, 1874, rated certain hereditaments previously exempt. On the other hand, the Agricultural Rates Act, 1896, exempted agricultural land from rates in respect of one-half of its rateable value, and the Agricultural Rates Act, 1923, extended the exemption to three-fourths. Acts were also passed in 1899, 1921, and 1922 partially or wholly exempting clerical tithe rent charge from rates for a period of years.

From this mass of legislation may be deduced the general proposition that the poor rate is a personal tax in respect of the occupation of a hereditament, and further, that the occupation must be beneficial, that is to say, it must be capable of yielding a profit over and above the average annual cost of keeping it up.

Union Areas.—The area of any poor-law union is now very much the same as when, in 1834, parishes were grouped together under schemes of the Poor Law Commissioners. In the formation of unions the Com-

missioners took into account the population, the rateable value, the probable amount of the cost of relief, and the situation of the existing workhouse. The union had to be sufficiently large to prevent predominance of narrow local interests, but not so extensive as to render control of details impossible. Unions were often grouped round a market town so as to provide a suitable centre for guardians' meetings and residence for salaried officers. Unions are not confined to any boundaries except parish boundaries.

The Valuation Lists.—The poor rate and the rates which follow it are based upon the valuation list for each parish; that is to say, the hereditaments included in a rate must be rated according to the rateable value shown for them in the valuation list, and it follows that no hereditaments can be rated except those which are inserted in the valuation list with a rateable value against them. There are, however, two exceptions to this rule. First, if a hereditament which is assessed in the list as a whole becomes by a change of occupation liable to be rated in parts, it may be so specified in the rate. Secondly, if a new house or other building comes into occupation during the period of a rate, it may be entered in the current rate, and charged as from the date of the entry in the rate book, but a supplemental valuation list must be made at the same time.

The valuation list must, like the rate, be made and signed by the overseers. It does not come into force until it has been approved by the assessment committee. For the purposes of such approval the valuation list must be transmitted to the assessment committee at the expiration of fourteen days after the notice of deposit in the parish concerned has been published. The assessment committee may alter the valuation list before approving it, and if any objection be made to the original valuation list, or to the valuation list as altered by the assessment committee, they must hear and determine the objection before approving the valuation list. The assessment committee have power before approval to increase as well as reduce the values entered in it. If they make any alterations in the original valuation list, they must redeposit the valuation list in the parish concerned for a similar period before final approval, fixing a day for objections. Upon approval the valuation list is signed by the members of the assessment committee present at the meeting; and a copy so signed, and countersigned by their clerk, is sent to the overseers.

Every railway, canal, gas, and water company which is assessed in any parish where it has no office or place of business, is entitled to receive from the assessment committee, at any of the company's principal offices, a notice of the rateable value at which it is assessed in a new or supplemental list within fourteen days of the transmission of the list to the assessment committee. Where, however, a railway company has an office in a parish, the anomaly arises that it is not entitled to notice in respect of any alteration of its assessment in that parish.

Appeals.—Any person assessed who wishes to have his assessment

reduced, or who claims not to be rateable, must as a condition precedent to his obtaining relief give notice of objection against his assessment to the assessment committee. This objection is heard by the assessment committee, and if (where his claim is for reduction in value, not for omission) they grant him relief which he considers sufficient, the person assessed need go no further, for the assessment committee must send notice of the amendment to the overseers, who must alter their then current rate accordingly. If no relief or insufficient relief is granted by the assessment committee, the remedy of the aggrieved person is by way of appeal against the rate either to special sessions or direct to quarter sessions. Where the claim is for omission from the rate, the person rated must appeal to quarter sessions.

Valuations in the Metropolis.—The Valuation (Metropolis) Act, 1869, differs from the Union Assessment Committee Act, 1862, in the following respects: (1) A new valuation list is made for each parish every five years. A supplemental list made during such a period ends with the termination of that period. Provision is made for an annual revision. (2) The overseers send a copy of their proposed valuation list to the surveyor of taxes. The surveyor can, however, only alter the gross value, but his alteration may have the effect of compelling the assessment committee, to whom he forwards the lists, to alter the rateable value. The figures of the surveyor of taxes are accepted unless proved wrong by a ratepayer, whose notice of objection must specify the correction desired. The surveyor may appeal to quarter sessions. An appeal against a rate is not a condition precedent to an appeal to sessions (which appeal is against a valuation list). The sessions chairman has a casting vote. (3) The overseers give notice to an occupier where they increase an assessment or insert a new building. (4) The gross value as appearing in the valuation list when approved by the assessment committee is conclusive as regards Schedule A, Income Tax. The rateable value is also binding for the charging of water rates as well as the poor and other rates. It is also conclusive for licence duties. (5) A maximum scale of deductions from gross to rateable is laid down for properties other than tithes and railways. (6) Owners and occupiers are required to make returns under a penalty in the same way as for income tax. (7) Increases in assessments operate from the date of service upon occupier of a copy of provisional valuation list, which may be during the currency of a rate. (8) Errors in a rate may be corrected by justices.

Rates and Taxes.—The expression "rates and taxes" is usually used to connote imperial taxes (which includes income tax and land tax) and local rates. Tithe rent charges are also frequently included in the phrase.

Income Tax.—Landlords' property tax under Schedule A of the Income Tax Acts is charged upon income derived from land and buildings. It is collected from the tenant, who has the inalienable right to deduct it from the next payment of rent. The tax is generally assessed upon the gross estimated rental, with a statutory and fixed allowance for repairs.

Tenants' property tax is a tax levied under Schedule B of the Income Tax Acts, being a tax upon an occupier for the income derived from the occupation of the land. It used to be charged upon one-third of the full annual value. For the fiscal year 1923–4 the basis of assessment is the single annual value, less the value of any cottages. Annual value means the full rent where the landlord pays the tithe-rent charge and bears the repairs and the tenant pays the rates. Income tax may vary in poundage from year to year.

Land Tax.—Under the feudal system each manor had to produce its quota of fighting men. The system survived to some extent until the reign of Charles II, when liability to military service was commuted into the land tax, which under some form or other had been levied for centuries. In 1692 an Act was passed imposing a duty of 4*s.* in the £ upon all real and personal property and upon all profits and salaries of persons holding offices. In 1697 the sum to be raised in England and Wales was fixed at about one and a half millions, and certain sums were named to be contributed by each county, city, and place mentioned in the Act. In 1797 the amount to be raised was fixed at £1,989,673, and the sum to be paid by each place named in the Act was specified. In 1798 an Act was passed making the tax a permanent one chargeable on land only.

The gross value of the poor-rate assessment is usually the basis of the assessment, and the tax is levied by an equal rate in the £ upon hereditaments within the parish chargeable with the tax. As the quota for the various parishes is fixed, while the value of property in some parishes increases rapidly, the amount in the £ varies greatly, but under the Finance Act, 1896, land tax may not exceed 1*s.* in the £ in any parish, and when less than 1*d.* it must be increased to 1*d.* In many parishes the surplus produced by a penny tax has automatically redeemed the whole of the quota, and such parishes are now tax free. It is the only tax capable of being redeemed, and it may now be redeemed at twenty-five years' purchase.

Inhabited House Duty.—This duty was only levied on premises over £30 in annual value, and house property was charged with 50 per cent more duty than shops, inns, farms, registered lodging-houses, &c. The duty increased as values mounted. Thus houses up to £60 paid a duty of 3*d.* in the £; between £60 and £90, double that amount; and over £90, 9*d.*, an increase of 50 per cent. The duty was levied on gross annual value, but has now been repealed by the Finance Act of 1924.

Tithes.—The practice of paying tithes is of great antiquity, but the exact time and manner of their introduction has been the subject of great controversy. It is certain, however, they were paid long before the Norman Conquest. They were of three kinds: predial, which arose from the soil; mixed, the produce of animals; and personal, arising from labour. Predial and mixed tithes were paid in kind, and personal from clear profits down to 1836, unless there was a special Act or custom to the contrary. In that year an Act was passed providing for the commutation of the tithe into a rent charge in lieu thereof. Commissioners were appointed to ascertain

the clear average value of the tithes of a parish according to the average price per bushel for the seven years ended Christmas, 1835, and to apportion such value upon the lands charged therewith.

Prior to 1919 the sum actually payable in respect of any tithe-rent charge varied from year to year in accordance with the average prices of wheat, barley, and oats, for the seven years ending the next preceding Christmas, as published in the *London Gazette* in January in each year. Under Section 1 of the Tithe Act, 1918, however, the sum payable in respect of any tithe-rent charge due on or before 1st January, 1926, is to be ascertained by the septennial average prices published in January, 1918. The sum payable for any tithe-rent charge due after 1st January, 1926, is to be ascertained by the average prices of the preceding fifteen years instead of seven, and the prices are to be published in the *London Gazette*, January, 1926, and each subsequent year. The net annual value of the rent charge varies because of the differing amount of the rates, land tax, and cost of collection in different localities. This reflects itself in the cost of redemption, which may vary from fourteen to twenty-two years' purchase of the commuted value.

Lands Clauses Act, 1845.—Under Section 133 of the Lands Clauses Act, 1845, it is provided that when the promoters of an undertaking acquire lands charged with land tax, or assessed to the poor rate, they shall, until the authorized works be completed and assessed, be liable to make good the deficiency in the assessments for land tax and poor rate by reason of such lands having been taken or used for the purposes of the works; and such deficiency shall be computed according to the rental at which such lands were valued or rated at the time of the passing of the special Act. If at any time the promoters of the undertaking think fit to redeem such land tax, they may do so in accordance with the powers in that behalf given by the Acts for the redemption of the land tax.

This section does not apply to any rate other than a poor rate. If, however, a borough rate is levied with and forms part of the poor rate, the section includes such rate. Further, if a railway company acquire lands under their special Acts which may become void for long periods before the authorized works are completed, they cannot avoid paying the poor rates thereon in spite of the fact that there is no beneficial occupation on their part.

CHAPTER II

Railway Valuations

Passing from the history of parochial assessments in England and Wales, the method of valuing a railway on the parochial principle, as distinct from the "cumulo" method, which obtains in Scotland and Ireland, must now be considered.

1. THE RAILWAY LINE, OR DIRECTLY PRODUCTIVE PART

Railways are seldom, if ever, actually let as a complete entity in a single parish, and it is therefore necessary to visualize a hypothetical person who is prepared to become tenant of the line of railway in a particular parish and to provide the rolling stock and all articles necessary to conduct the business of a carrier. Such a tenant would need to ascertain the annual gross receipts, the expenses he would incur in earning those receipts, and the working capital required. When the working expenses and a sum for interest and trade profits are deducted from the gross receipts, the result

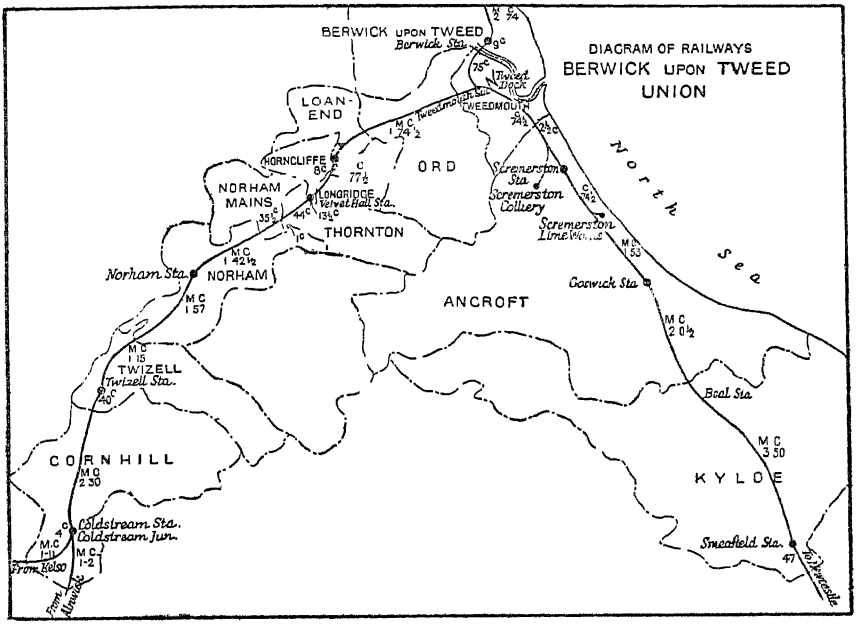


Fig. 1.

will give the gross rent from which the cost of maintaining the hereditament in a state to command the rent has to be deducted, leaving the final figure the rateable value of the line of railway in the parish in question.

It should be borne in mind that for valuation purposes a railway is divided into two portions: (*a*) the "directly productive" part, that is to say, the line of railway; and (*b*) the "indirectly productive" portion, or stations.

The valuation of the directly productive portion is based on gross receipts less working expenses, &c., and that of the indirectly productive portion by a percentage on the estimated value of buildings and site. A separate valuation for each parish is required.

The first step in preparing a valuation of a railway is to ascertain the exact length of line in the parish or parishes under consideration, and for this purpose a diagram is prepared in the form shown in fig. 1, which gives

the geographical miles of railway in each parish in the union, but does not show the miles of single track, which must be ascertained separately.

The form of valuation usually adopted is as follows:

*Parish of*_____*in the*_____*Union*

*County of*_____

VALUATION OF LINE OF RAILWAY FOR THE YEAR 19

	£	£	£
Length of Double or Single Railway in the Parish Miles Chains Train Miles			
Gross Receipts. s.			
Passengers .. .. ____ at			
Goods .. .. at			
Running Power Traffic .. .. at			
Total ..			
Working Expenses.			
Locomotive Power:—			
Passenger Train Miles, at £ . per train mile			
Goods and Mineral Train Miles, at £ . ,,			
Carriage and Wagon Repairs and Renewals:—			
Passenger Train Miles, at £ . per train mile			
Goods and Mineral Train Miles, at £ . ,,			
Miscellaneous Expenses:—			
Traffic Expenses at General Charges at Miscellaneous at } . per cent on Gross Receipts of £			
Government Duty at £ . ,, Passenger Receipts of £			
Rates and Taxes at in the £ on New Rateable Value of £			
Net Receipts due to Line and Stations			
Deduct for Rental Value of Stations, and other Properties separately assessable, at per cent on Gross Receipts of £			
Net Receipts due to Line of Railway			
Tenants' Allowances.			
Capital required at per cent on Gross Receipts of £ = £			
Occupiers' Share:—			
Interest on Tenants' Capital Trade Profits ,, ,, Risks, Casualties, &c. } per cent on Tenants' Capital of £			
per cent on Net Receipts from other Companies, £			
Gross Estimated Rental of Railway			
Landlords' Statutables:—			
Repairs, Maintenance and Renewal of Way and Works Miles Chains at £ per Single Mile			
Rateable Value of Line of Railway			

The first item mentioned in the form is gross receipts in the parish in question. These receipts are obtained by dividing all fares and rates received from traffic passing over the line in the parish in the ratio which the geographical miles in the parish bear to the geographical miles traversed by the passengers and goods. Terminals (i.e. charges for services performed at stations) are miled, and where one is on a "foreign" line it is miled up to the point of junction. The calculation thus made is exceedingly costly, and it is usual to take out figures for two months in different parts of the year and multiply the result by six. The figure thus obtained, less cost of "collection and delivery", constitutes the first figure in the valuation, together with the train miles worked in the parish. The latter are ascertained by means of the operating men's journals, and the figures for two average months are usually considered sufficient when multiplied by six.

The next item in the valuation form is working expenses, and in order to obtain this information "General Schedules" are prepared for each system from the railway companies' published yearly accounts in the following shape:

GENERAL SCHEDULES FOR THE YEAR .....

GROSS RECEIPTS FROM RAILWAY TRAFFIC

	£	£	Total. £	Percentage to Gross Receipts. %
By Coaching Traffic				
Less paid on Running Power Traffic..				
By Freight Traffic—				
Merchandise				
Live Stock				
Minerals				
Mileage and Demurrage ..				
Less paid on Running Power Traffic				
Total for Year ..			£	

Total Traffic Expenditure in respect of Railway Working, £

Equal to per cent of the Total Traffic Receipts.

LOCOMOTIVE MILEAGE AND EXPENSES

Train Mileage:

	Total Train Miles
Coaching (Steam)	
Coaching (Electric and Petrol) ..	
Freight (Steam)	
Freight (Electric)	

Expenses, Locomotive Power:—

Running Expenses: £

Superintendence .. .. ..
Steam Train Working .. ..
Electric Train Working .. ..
Petrol Rail Auto-car Working ..

£

Deduct Engine Power supplied to and by the Company .. ..

£

Maintenance and Renewal of Rolling Stock

Total Expenses for Year .. .. .. £

Per Train
s. d. Mile.

Total Expenses for Year .. .. .. ——— = =
Total Train Mileage .. .. ..

Total Expenses for the Year divided as follows:—

£

Coaching .. ..
Freight .. ..

d.

Coaching Locomotive Expenses per train mile ——— = = £

s. d.

Freight Locomotive Expenses per train mile ——— = = £

Carriage and Wagon Expenses

Carriages:

£

Superintendence, Repairs, Renewals, &c ..
Coaching Train Miles .. ..

£ d.

Carriage Expenses per Train Mile .. ——— = = £

Wagons:

£

Superintendence, Repairs, Renewals, &c. ..
Freight Train Miles .. ..

£ s. d.

Wagon Expenses per Train Mile .. .. ——— = = £

Miscellaneous Expenses

	£	Total. £
Traffic Expenses	..	
General Charges		
Deduct Fire Insurance		
Compensation (Accidents and Losses)		
Law Charges		
National Insurance Acts		

Equal to per cent on £ Gross Receipts

Government Duty

Duty. £	Coaching Receipts. £

Equal to per cent on £ Coaching Receipts

Schedule of Tenants' Capital

	£	£
Working Stock		
Shunt horses, telegraph and telephone instruments, tools, barrows, station furniture, wagon sheets, sacks, &c.		
General Stores:		
Stock of materials on hand		
Deduct for Landlord's stores		
Floating Capital		
		£

Equal to per cent on £ Gross Receipts.

Maintenance and Renewal of Permanent Way

	£	£
Maintenance and Renewal of Way and Works		
Deduct Repairs of Stations and Buildings		
Repairs of Roads, Bridges, &c.		
Salaries, &c., due to above (proportion)		
Net amount Maintenance and Removal of Permanent Way ..		£

Total Train Mileage .. ..

d.

―――― = = £ per Train Mile.

Cost of Maintenance and Renewal of Permanent Way per single mile:

	M.	C.
Total length of single running line		
Less Joint Lines		

	M.	C.
Total length of Sidings reduced to single line ..		
Less Joint Lines		
$\frac{1}{3}$		

―――― = £ per single mile.

The schedules speak for themselves, and from them the various figures required in the valuation are calculated. The working expenses call for little comment. " Rates and taxes " might be more accurately described as local rates, and the fact that a railway enjoys partial exemption from certain rates should not be overlooked in the calculation.

Apart from the deduction made in respect of working expenses from gross receipts, it is necessary to allow a deduction for stations separately assessable, because the gross receipts include a sum charged for the user of the stations, which are common to the whole of the railway.

This deduction is based upon the rental value of the stations and other indirectly productive properties (plus maintenance and rates and taxes) of the whole system. The proportion which the gross receipts bear to the total rental value of the stations compared with the gross receipts of the parish gives the percentage figure to be deducted. When the allowance for stations has been made, the resultant figure gives the net receipts in the parish, and from this figure the occupier's share requires to be deducted, as the hypothetical tenant would require a profit on his capital outlay before he paid a rent.

The principal articles considered necessary for the tenant's use are the following:

Locomotives;
Carriages;
Wagons;
Vehicles used for railway services;
Machinery not attached to the freehold;
Tools;

Drawings and patterns;
Locomotive stores;
General stores;
Uniform and clothing;
Stationery;
Rate books;
Wagon sheets;
Ropes, chains, and slings;
Office and station furniture;
Clocks;
Barrows;
Time-table boards;
Telegraph instruments and electrical appliances and tools;
Guards' and brakesmen's watches;
Shunt horses and harness,

which with all others needed to work the undertaking have to be valued.

One of the most controversial questions arising in the course of a valuation is the value to be allocated to such articles and the allowance to be made thereon.

Certain figures appear in the company's published yearly accounts which represent the capital expenditure in respect of working stock, but the correct figure to accept is an actual valuation of the working stock as it stands at the date when the reassessment is made, after allowing for depreciation.

The last item, that of floating capital, represents permanent bank balances not earning interest, petty cash, and credits given to traders.

The total amount of the tenant's capital having been ascertained, it is then divided among the parishes concerned in the ratio which the parochial gross receipts bear to the gross receipts of the whole railway.

An allowance is then made on such capital, which in the case of the London and Middlesex quarter sessions is 17½ per cent, and in the provinces slightly lower percentages have occasionally been adopted.

The allowance is made up thus:

(1) On capital, working stock, &c.,
20 to 17½ per cent, made up thus:
(*a*) 5 per cent on capital;
(*b*) 10 per cent for trade profits;
(*c*) 5 to 2 per cent for trade risks.
(2) Stores, 10 per cent.
(3) Floating capital, 5 per cent.

And in this connection the following expression of opinion by His Honour Judge Tindal Atkinson, when giving the decision of the Herts quarter sessions in the case of the *G. N. R. Co. v. Hitchin Union* (1906), is of interest. He said:

" The investigation of the figures shows that the net receipts of the line amount

to a certain sum, and what under the circumstances could the tenant reasonably insist upon and expect to obtain, and the landlord as a reasonable man agree to, as the tenant's share of the profits?

"The tenant risks his capital, in this case amounting to a very large sum, viz. £7,180,661. He has to give his labour and skill in the carrying on of the undertaking. He has to face the chances of all kinds of contingencies which either for a time stop or much impede the profitable working of the line. He has to employ an immense number of hands, and to bring to bear upon the whole working of a most complicated business great powers of administration, and to have sufficient money always available. Having once agreed to the rent he has to pay it whatever may happen, even though for one or more years all profits may be swept away, and the line worked at a loss. Although competition is an important factor, we have to consider what would be the probable action of an ordinarily prudent person proposing to become tenant of the line, having regard to his own interests and the risks he would have to run."

The tenant's share having been deducted from the net receipts, the landlord's statuables fall to be deducted. This amount is determined by the nature and extent of the railway lines and bridges, &c., in the parish, with an addition in respect of works of an extraordinary character on other parts of the line. When this figure is obtained and deducted, the resultant figure constitutes the R.V. of the line of railway in the particular parish.

The question of the percentage to be allowed for receipts arising from running-power traffic in any parish, and also the allowance in respect of traffic carried in private owners' wagons, is a matter which requires to be settled according to the merits of every individual case. An allowance is always made in respect of goods carried in private owners' wagons, otherwise the tenant would be assumed to make nothing by the transaction.

The method of valuing a railway above described was founded upon rules laid down by the courts for the rating of canals, and assuming that sufficient allowances are made under the different headings, the result should provide a fair measure of rateable value upon which the line of railway under consideration should be properly assessed.

2. STATIONS, OR INDIRECTLY PRODUCTIVE PART

In valuing a station, a survey is first made and a plan prepared, showing the lines which are directly productive. The more directly productive lines there are the lower will be the assessment of the railway in the parish by reason of the greater deduction for cost of maintenance and renewal of such lines.

The areas of the land and buildings and the cubical contents of the buildings of a station are calculated, and the structural value is based upon these figures. A percentage is then placed on the sum so found to decide the gross estimated rental, and a deduction for repairs gives the rateable value.

The importance of the question of what are directly productive lines is shown by the fact that five leading cases dealing with the question have

been decided by the courts. These are the *Fletton Case*, 1882 [G.E.R. Co. *v.* Fletton (see Appendix No. iii, Balfour Browne on Rating, p. 631)], the *Stockport Case* [Stockport Union *v.* L. & N.W.R. Co. (1898) 67 L.J. Q.B. 335, 78 L.T. 180], the *Salford Case* decided by Mr. W. C. Ryde, K.C., in 1905, the *Edmonton Case* [G.N.R. Co. *v.* Edmonton Union (1905) 69 J.P. 179, 316; 1 Konstam, 186], and the *Taff Vale Case* [(1907) 71 J.P. 529; see para. 18 of the Special Case]. The effect of these decisions will be shown with the aid of the accompanying plan (fig. 2), which is drawn to embody all five decisions.

Salford Case Decision.—The following quotation from Mr. Ryde's decision in the Salford case shows the reason for excluding the directly productive lines from the station assessment:

" The decision in Reg. *v.* Eastern Counties Railway Company, 1863, was based upon and intended to be an application of a principle laid down in earlier cases, and that principle can best be understood by a reference to those earlier cases. The principle of valuation laid down by those earlier cases is that the undertaking of a railway company, gas company, or water company is to be divided into two parts, viz.: That which is directly productive of profit to the company; and that which is indirectly productive of such profit; that the second of these two cases comprises things which, in themselves, are burdensome and productive of expense rather than profit to the company, but which are necessary to the production of profit, on the first part; that the aggregate of the separate valuations of the two parts represents, or ought to represent, the combined value of the whole, and that the value of the first part represents what is left after the value of the second part has been deducted from the value of the whole. Although in Reg. *v.* Eastern Counties Railway, 1863, the terms ' line ' and ' stations ' are used, they are used merely as convenient names for the two parts of the railway system above referred to, and not as conclusive of the question in which part a particular section of the undertaking is included.

" One of the grounds of decision in Reg. *v.* Eastern Counties Railway, 1863, was that the sum paid to a railway company for the carriage of a particular parcel of goods from one place to another was to be regarded as an indivisible amount paid for the entire service of carriage between those two places, and that the services (*inter alia*) of loading and unloading constituted parts of the entire service for which the company were paid that indivisible amount, and that the logical result of this ruling is that the lines on which wagons stand while they are being loaded and unloaded must be regarded (so far as relates to the particular consignment being loaded or unloaded) as included in that part of the company's undertaking which directly contributes to earning the indivisible amount paid for the carriage of that particular consignment.

" If I am bound by Reg. *v.* Eastern Counties Railway, 1863, to hold that terminals must be regarded as part of the indivisible sum paid for carriage of a consignment of goods between two places, and must be regarded as earned by the line between those two places, it follows that the service of carriage must be regarded as beginning not later than the time when the goods are loaded in the railway wagon, and ending when they are unloaded or handed over by the railway company, and that the line over which the goods travel from beginning to end of the journey must be regarded as directly productive of the sum paid to the company

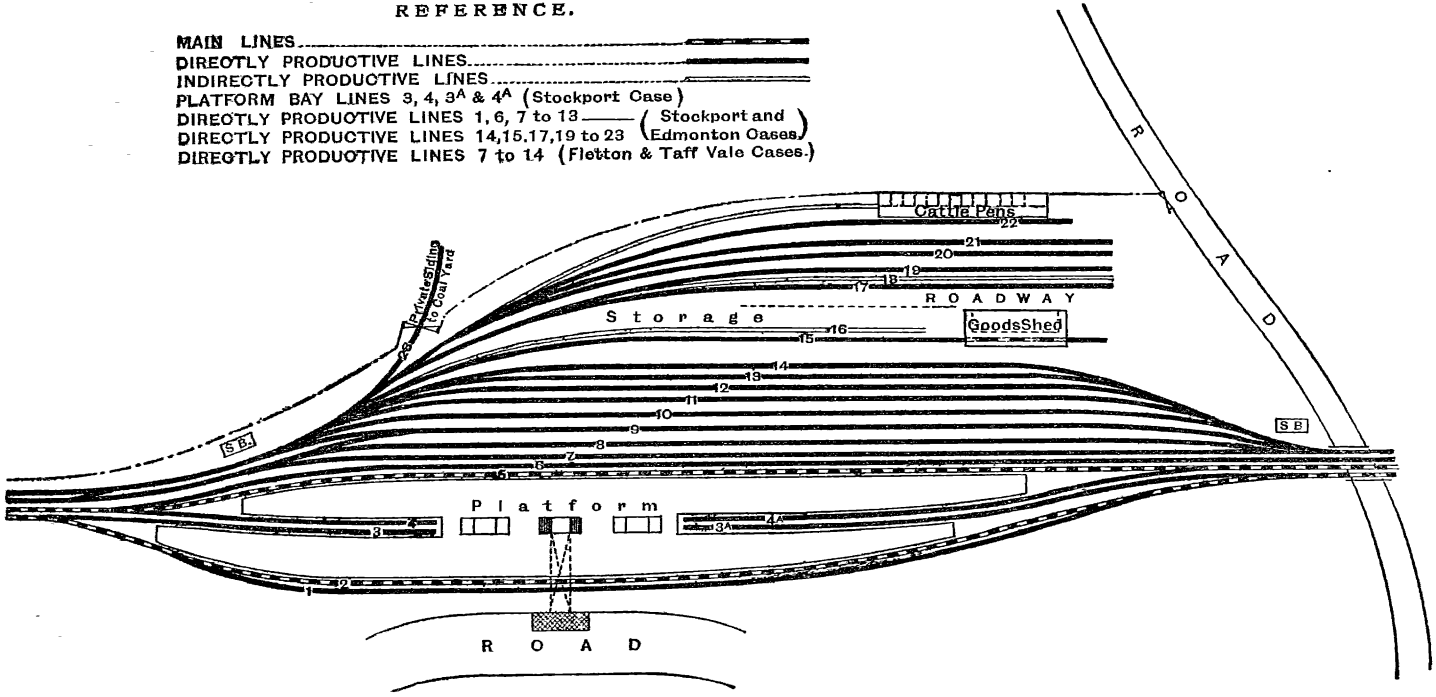


Fig. 2.—Plan of Passenger and Goods Station

for the carriage of these goods, and that the Court, in deciding Reg. *v.* Eastern Counties Railway, while they ruled that it was wrong to regard terminal charges as earned exclusively where terminal services were rendered, did not mean to decide that terminal charges must be regarded as earned exclusively by those parts of the company's line on which the terminal services are not rendered.

" If the Court of Queen's Bench did decide in Reg. *v.* Eastern Counties Railway Company that terminal charges must be regarded as earned exclusively by those parts of a railway company's line on which terminal services are not rendered, then that decision is impliedly overruled as to this point by the decision of the Court of Appeal, in Stockport Union *v.* London and North-Western Railway Company, 1898. In that case line No. 5 (which was a line leading into a warehouse where goods were loaded and unloaded) was held by the Court of Appeal to be part of what was called in that case ' running line ', that is, the line directly productive of profit, and therefore the Court of Appeal in effect held that in valuing line No. 5 the terminals and the charge for conveyance ought to be spread equally over that line together with the rest of the lines over which the goods for which the charge was made were carried.

" When a train or railway wagon in conveying goods between two points diverges from the direct route between these two points and passes over other lines of rails, the question whether those other lines of rails ought to be considered as directly productive of profit, should be answered with reference to the following considerations. If A and B are the two termini of a double line of rails, consisting of an up and down line, and on the down line the traffic is so heavy that it is necessary to double that down line along the entire distance from A to B, and each of those down lines is used only for the conveyance of goods from A to B, then, in my opinion, the whole of the two down lines should be valued as directly productive of profit. If the traffic on the down line is too heavy for a single line all the way, but it is found to be sufficient to double that line for a part only of the distance, in order that slow trains may run on one line and the fast trains may run past them on another, and each of these down lines is used only for the conveyance of goods from A to B, then, in my opinion, the whole of the two down lines (both the through and the relief line) should be valued as directly productive of profit. The same principle of valuation should be applied even though the slow trains on the relief line may come to a stand and wait for a considerable period until the fast trains on the through line shall have passed, and even though owing to the block in the traffic the engine drawing the train on the relief line may be detached and go away to do work elsewhere before returning to fetch the train on the relief line. On the other hand, if a train leaves the direct route between A and B, and goes on other lines merely in order that the wagons may be marshalled and broken up or made up with other wagons into trains for the more convenient working of the railway company's business, then such other lines should be valued as indirectly productive of profit."

Edmonton and Taff Vale Decisions.— In the Edmonton case, which confirms Mr. Ryde's decision above quoted, it was held that lines used primarily for loading and unloading and lines used primarily for giving access to such lines were directly productive. The distinction to be observed is between lines which are directly and lines which are indirectly productive of profit; that which the public pay for is conveyance of goods

or passengers from one point to another, and the company's service begins as soon as the goods are loaded and continues until they are unloaded, and therefore every line which is necessarily traversed by the vehicle which gives this conveyance is directly productive; and though a line may fan out into four or more lines when it gets to a station, if all these four lines are used primarily for conveyance of goods or passengers they should be treated as directly productive.

In the Taff Vale case the lines claimed were used for the relief of the main running lines by providing places where coal wagons passing from certain collieries down to the port could wait until a ship was ready to receive the coal, and the largest portion of the receipts in the parish was earned by wagons which ran over these relief lines and not over the main running lines. It was found that the gross receipts in the parish would probably have been much less had the relief lines not existed.

It was held by the Court of Appeal in the Taff Vale case that, on these facts, the relief lines were rightly valued as directly productive lines.

CHAPTER III

(1) Differential Rating; (2) Rating Authorities; (3) Rating in Scotland and Ireland; (4) The Future.

1. DIFFERENTIAL RATING

This branch of rating work is of great importance to a railway company, especially where a line runs through an entirely urban district.

Statutory Exemptions.—It was early laid down by Parliament that land used as a railway for public conveyance should be exempt from any rate made for sanitary expenses to the extent of three-fourths of the rate, and the courts held that the exemption of two-thirds to the lighting rate enjoyed by land should extend to railways. The argument doubtless advanced was that neither lighting nor sanitation was incurred for the line of railway, and effect to this exemption was given by the Public Health Act, 1848. There were, however, exemptions inserted in private Acts of various corporations prior to that date.

The exemption in respect of the general district rate was also inserted in the Public Health Act, 1875, and appears as follows:

Section 211 (*b*).—" The owner of any tithes, or of any tithe commutation rent charge, or the occupier of any land used as arable, meadow, or pasture ground only, or as woodlands, market gardens, or nursery grounds, and the occupier of any land covered with water, or used only as a canal or towing path for the same, or as a railway constructed under the powers of any Act of Parliament for public

conveyance, shall be assessed in respect of the same in the proportion of one-fourth part only of such net annual value thereof."

The words are repeated almost word for word in Section 230 of the same Act in respect of Special Expenses.

There has been a good deal of litigation between the railway companies and local authorities upon the question as to whether any particular description of railway property comes within the three-fourths exemption or not—and the various decisions of the courts may be tabulated as under.

Three-fourths exemption is allowable in respect of the following properties:

1. Lines of railway.
2. Sidings and turn-tables.
3. Platforms (but not lounges or circulating areas).
4. Signal boxes and levers.
5. Awnings over platforms and lines.
6. Loading ways and carting spaces.
7. Loading platforms or mounds.
8. Cattle loading platforms or mounds.
9. Cattle pens adjacent to sidings.
10. Hoist houses and hoists.
11. Capstans and their machinery.
12. Cranes.
13. Water-tanks, &c., being necessary for the physical operation of the railway.
14. Engine sheds to shelter and protect locomotives in use.

The principal cases dealing with these matters are as follows:

Items 2 and 4. *South Wales Railway Co. v. Swansea Local Board* (1854), 4 E. and B. 189.

Item 5. *L. & N.-W. Railway Co. v. Llandudno Improvement Commissioners* (1897), 1 Q. B. D. 287.

All other items. *L. & Y. Railway Co. v. Liverpool Corporation* (1915), A. C. 152.

The House of Lords in the Liverpool case decided that the exemption was not to extend to roofs over goods depots where such roofs were in themselves part of the station buildings, and as such distinguishable from the roofs over passenger stations (such as at Llandudno), which were in the nature of an adjunct to the platform or rail. They also held that approach roads to loading ways or roads and the land thereunder, and buildings and land thereunder, do not come within the exemption.

Footbridges and subways connecting platforms come within the same category as the platforms themselves, and should be rated at one-fourth.

2. RATING AUTHORITIES

Metropolitan Rating Authorities.—In the metropolis the Westminster City Council and London Municipal Boroughs levy a general rate

in respect of disposal of house refuse, sweeping, cleansing, and repairing of streets, lighting, sewerage, baths and washhouses, public libraries, sale of food and drugs, cost of collection expenses, and include in the rate the following matters:

Contributions to the London County Council by the various councils and boroughs, for purposes other than the Equalization Fund under the London (Equalization of Rates) Act, 1894.
General county purposes other than education.
Special county purposes not within the City of London.
Education, elementary and higher.
Contributions to the Receiver for Metropolitan Police District.
Contributions to the Central (Unemployed) Body for London.
Relief of the Poor and other expenses of Guardians.
Contributions to the Managers of the Metropolitan Asylum District and the Metropolitan Common Poor Fund.

County Councils.—The expenses of a county council for general county purposes, which comprise police, highways, education, asylums, and general matters, are met by a county rate, which is a flat rate levied upon all parishes in the administrative county according to the county rate basis for each parish. This basis need not conform to the poor-rate valuation or Schedule A, but can and very often does differ from both. It is not competent for an individual ratepayer to object to the basis for his parish, as this is a matter for the parochial authorities. Expenses for special county purposes are chargeable only to the area concerned. The county rate is not levied as a separate rate, but is collected with and forms part of the poor rate.

County Boroughs.—In many county boroughs the method of levying rates differs. At Manchester all the expenses are raised through the poor rate with the exception of the owners' water rate, which is in the nature of a fire protection rate. At Rochdale there are two rates, poor and corporation; but the corporation have full control over the whole of the expenditure except relief of the poor, including the police and education (elementary and higher). In some boroughs (not county boroughs) the charter of incorporation includes the provision of police, whilst others are policed by the county.

A movement has commenced for consolidating all the various rates levied in many county boroughs and making a single rate to provide for all requirements instead of levying two or more rates. The preservation to railway companies of their existing three-fourths exemption in respect of rates levied under the Public Health Act (or in respect of partial exemptions under special statutory enactments) is usually effected by granting a percentage abatement of the total rate upon such parts of the railway properties as previously enjoyed the partial exemption.

Urban Districts.—In urban districts the council controls the general district rate, which covers the expenses in connection with sewage, highways, cemeteries, baths, lighting of the district, &c., and in districts of over 20,000 inhabitants they may have charge of elementary education, education

expenses being recouped by a precept on the overseers for the balance required after the receipt of the Government grants.

The poor rate in urban districts includes charges for the relief of the poor and for county purposes, which include police, also higher education and elementary education when the district has less than 20,000 inhabitants.

Rural Districts.—In rural districts four rates may be levied: (1) the poor rate, which covers (*a*) the cost of the relief of the poor and other expenses of the guardians, (*b*) the contributions of the parish to county expenditure, (*c*) the general expenses of the rural district council (including non-county roads), and (*d*) the expenses of the parish council and the overseers; (2) a special expenses rate for sums expended by a rural district council on sewerage and water-supply, and chargeable to particular parishes; (3) a lighting rate in such parishes as have adopted the Lighting and Watching Act, 1833; and (4) a burial rate where the Burial Acts have been adopted.

3. RATING OF RAILWAYS IN SCOTLAND AND IRELAND

It may now be well to compare the machinery of valuation in England and Wales with Scotland and Ireland.

In Ireland land is valued with reference to the average prices of specified articles of agricultural produce, but with this exception: the basis of assessment of all hereditaments, including railways, in all parts of these islands is the yearly rent which might reasonably be expected for them. In England and Wales, however, the part of the railway system in each parish is separately valued by the overseers, who may employ a professional valuer, or by the assessment committee of the union concerned; whilst in Scotland and Ireland each railway is valued as a whole by a Government official, and the total value divided amongst the parishes intersected by the line of railway.

Scotland.—In Scotland some ten Acts of Parliament are concerned with the rating of the railways, but the most important is the Valuation of Lands (Scotland) Act, 1854 (17 and 18 Vic. c. 91), which provides for the appointment of an assessor of railways and canals, who "shall inquire into and fix *in cumulo* the yearly rent or value in the terms of this Act of all lands and heritages in Scotland belonging to or leased by such railway and canal company and forming part of its undertaking". The assessor deals also with tramways, and may be required to value other undertakings which extend into more than one rating area.

The cost of the valuation is borne by the railway companies in proportion to annual value, and the assessor has power to call upon the companies to compile any information he desires. The assessments are revised annually. The local authorities or the company or both can appeal from the decision of the assessor. If the railway is situated wholly in one county, the appeal is to the sheriff, otherwise the case is heard by the Lord Ordinary on the Bills officiating in the court of sessions.

The law and practice of the assessor are now well established and have

the weight of seventy years of experience behind them. For the purpose of his valuation the assessor takes into consideration the average results for the previous three years, and the valuation of the tenants' capital and the allowances to be made thereon have been long stabilized by decisions of the courts.

The result of the assessor's valuation is gross value. County and burgh rates are levied on gross value, but deductions of varying amounts are made by the local authorities to arrive at the assessment for poor and school rates.

A division of the cumulo valuation is then made between the stations and the line of railway. The capital value of the site and buildings of the railway stations, docks, and sidings is ascertained, and 5 per cent thereon is calculated and deducted from the cumulo valuation. The amount so deducted is allocated to the parishes where the various properties are situated. The balance of the cumulo valuation remaining is divided amongst the parishes traversed by the line of railway, canals, or ferries, according to geographical mileage in the parish, by a uniform rate per mile. Single or double lines receive the same mileage rate, three or four tracks, double rate, and five or six, triple rate.

Ireland.—The valuation of railways in Ireland is made by a commissioner of valuation, who controls the assessment for local rates of all classes of properties. He is not limited to railways. The cost is borne by the Government, and although the commissioner has no power to compel the railways to assist him in any way, the railways afford all information required.

A reassessment only takes place if a property is put in the annual list for revision either by the local authorities or the railway company, and a railway as a whole cannot be dealt with by the commissioner unless all parts of it are entered in the district revision lists.

The local authorities or the railway company or both can appeal from the decision of the commissioner to quarter sessions presided over by a county court judge, whose decision is final as regards value, but from whom an appeal lies to the higher courts on a point of law. The valuations of the commissioner are, however, generally accepted by the local authorities and the railway companies. There is no gross value found; the only figure to be ascertained is " rateable annual value ".

The valuation of tenants' capital and the allowances thereon made by the commissioner are more in accordance with English practice than the allowances adopted in Scotland, and the commissioner usually takes into consideration the receipts and expenses for the three years immediately preceding the application for revision.

Having ascertained the cumulo valuation of the undertaking, the commissioner fixes the valuation of the stations at 4 per cent on the capital value of site and buildings, and these amounts are allocated to the various rating areas in which the stations are situate. The total of these valuations is then deducted from the cumulo valuation, and the balance remaining represents the valuation of the whole of the running line, which is apportioned among the various parishes on a basis which differs from that adopted in Scotland.

In the first place this balance is divided by the total train miles run over the whole system, and the average value per train mile ascertained. Then the line is sectionized by dividing it into portions upon which there is a uniform train service. The train miles run upon each such section of line are then taken out for two average months of typical traffic and multiplied by six. The whole year's train miles of each section is thus obtained. The average value per train mile for the whole system is then multiplied by the number of train miles for the year run in the particular section. The result gives the value for the lines in the section, and it in turn is divided among the individual rating areas according to the proportion which the track miles in the area bear to the total track miles in the section.

(4) THE FUTURE

The Railway Position on the Termination of Control.—During the period of the Great War and until 15th August, 1921, the railways in the United Kingdom were in the possession and control of His Majesty's Government. Under the terms of the agreement between His Majesty's Government and the railway companies any profit or loss in working was a profit or loss to the Exchequer, the companies receiving payment based upon the 1913 net receipts. The guarantee of these receipts involved the Government in a heavy subsidy during the later period of control, and during the whole of the control scarcely any attempt was made to revalue the railways in any union in England or Wales. The position in Ireland was obscured by the unsettled state of the country. In Scotland the latest railway valuations made up in normal detail subsequent to the outbreak of the Great War were for the year 1915–6 (based upon accounts for 1913). Alterations were made in 1916–7, and again in 1917–8; but from the latter year until 1922–3 inclusive the valuations were in most cases stereotyped in consequence of Government control. For the year 1922–3 the total valuations of the several railways were with a few special exceptions reduced by 10 per cent.

To meet the position which would result on the ceasing of the Government control in England and Wales, negotiations were entered upon in July and August, 1921, between the Executive Committee of the National Conference of Assessment Committees of England and Wales and the railway companies, which resulted in an agreement intended to be embodied as a Clause in the Railways Bill then before Parliament. Owing, however, to the difficulty of applying the Clause to the metropolis, the Clause, which contained what are termed the " transitory provisions " was not inserted in the Railways Bill, but was subsequently adopted and given effect to by almost every assessment committee in England and Wales.

Under these provisions the assessment of the running lines and stations and other premises essential to the running lines appearing in the valuation lists on 10th September, 1920, were to stand until 31st March, 1922. Then for the two succeeding years the assessments were to be increased or

decreased by the amount of the percentage increase or decrease between the net receipts in Account No. 10 of the railway companies' published yearly accounts for 1913, as compared with 1921 and 1922, with the addition in the case of a decrease of 15 per cent, or the deduction of the same amount in the event of an increase.

Railway assessments have been increased or decreased throughout England and Wales in accordance with this formula during the two years ending 31st March, 1924, and it is anticipated that this formula, slightly modified, will be universally adopted for the year ending 31st March, 1925.

The Railways Bill of 1921 as originally introduced provided for a Scottish group into which the existing Scottish companies would have been amalgamated, and which would have presented no special difficulties for rating purposes. However, whilst the Bill was before the Standing Committee a new grouping was arranged. The Caledonian, the Glasgow and South-Western, and the Highland Railway Companies, and certain subsidiary companies, were grouped with what is now known as the London Midland and Scottish Railway Company; whilst the North British and Great North of Scotland Railway Companies, together with certain subsidiary companies, were grouped with what is to-day called the London and North Eastern Railway Company.

As the railway valuations in Scotland are based upon the receipts and expenditure of each separate company, and as separate accounts will not be kept of the receipts and expenditure of the Scottish portion of the Anglo-Scottish Railways, the present system will be rendered impossible of application. A Departmental Committee was accordingly set up by the Minister of Transport on 16th November, 1921, to consider the question. This Committee, in their report dated 10th November, 1922, considered that an essential preliminary to any permanent solution of the difficulty is that the principle of valuing railways *in cumulo* should be enacted for England and Wales. In this respect they restated the findings of the Royal Commission on Railways in 1867, the Royal Commission on Local Taxation in 1901, and the Departmental Committee on Local Taxation of 1914, all of whom pronounced in favour of English and Welsh railways being valued *in cumulo*. The Committee were also of opinion that no lasting and satisfactory solution could be achieved without legislative change, and considered that in the interim the " carry forward " plan (i.e. the plan of continuing in Scotland the last valuations made from separate accounts subject to such adjustments as may be agreed to be necessary to meet altered circumstances) the simplest method to adopt. The Committee were further of opinion that the cumulo valuation of the railways which extend into the two countries of England and Scotland should be made by a joint authority.

Since the publication of the Committee's report the Minister of Health (who was represented on the Committee) has drafted a Rating and Valuation Bill dealing in a comprehensive manner with the whole question of rating and valuation in England and Wales, and providing for the valuation of

railways *in cumulo*. The draft Bill has been circulated to all local authorities for criticism, and whilst many of the proposals embodied in the draft have received damaging criticism, the proposal for the valuation of railways *in cumulo* appears to be generally accepted. It may therefore be that this long-looked-for reform is at length within measurable distance of realization. Whilst the alterations proposed by the draft Bill will have a far-reaching effect if it becomes law, at the same time the general law relating to rating will to a considerable extent remain unchanged.

THE ELEMENTS OF RAILWAY GOODS RATES

BY

H. L. LISTER

The Elements of Railway Goods Rates

CHAPTER I

Evolution of Railway Rates

Among the many problems in connection with railways there are few which have engaged more attention on the part of the trading community than that of goods rates. For seventy years it has been a matter of controversy both in Parliament and without, and while many of the points of difference have been settled, the recent inquiry before the Railway Advisory Committee and the Railway Rates Tribunal reveals the fact that public interest in it has not abated. To get a clear idea of the legislation on the subject it is well to approach it, however briefly, from the historical point of view.

The earliest conception of a railway was a public highway open to all on payment of tolls for the conveyance of goods in wagons hauled by horses, much in the same way as carriers use the canals at the present day. One of the first of these, the Surrey Iron Railway, authorized in 1801, was a tramway from Wandsworth to Croydon, upon which wagons could be hauled with greater ease and heavier loads than upon the deeply rutted highways of this period.

The maximum tolls per ton per mile for the use of this tramway by the public were as follows:

(1) Dung .. .. 2*d.*
(2) Limestone, chalk, lime, and all other manures (except dung), clay, breeze, ashes, sand, and bricks .. .. 3*d.*
(3) Tin, copper, lead, iron, stone, flints, coal, coke, charcoal, culm, fuller's earth, corn, seeds, flour, malt, potatoes .. .. 4*d.*
(4) All other goods, wares, merchandise, and things whatsoever .. 6*d.*

This Act is a model of the toll clauses which were introduced into the special Acts of each company, but with the advent of the locomotive most of the Acts for the construction of railways between 1823 and 1839 provided for a reasonable charge in addition for wagons and engine power, when these were supplied by the companies.

About this time there were three systems in force on the principal lines:

1. The London and Birmingham Railway did not collect or deliver goods, this work being performed by carriers such as Pickford & Co., and Chaplin & Horne, fifteen such firms acting as carriers on this system in 1840.

2. The Grand Junction Railway between Birmingham and Liverpool and Manchester, both acted as carriers and allowed carriers to use their line.

3. The Liverpool and Manchester Railway acted as carriers, performing the service of collection in Manchester.

The charges on the respective systems were as follows:

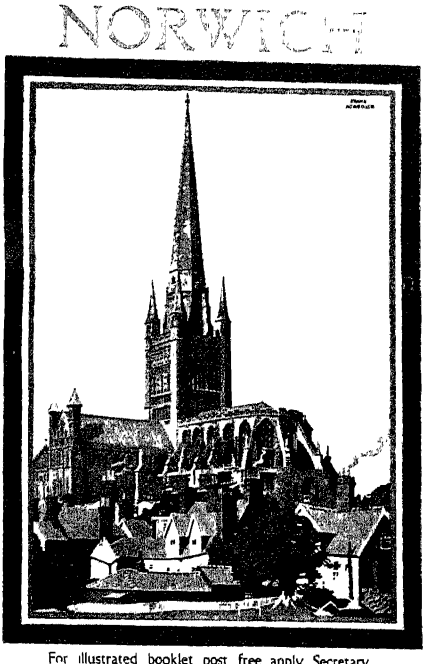
London and Birmingham Railway.—Toll or tonnage dues were charged by the company to the carriers between London and Birmingham for the use of the railway, and the provision of wagons, at rates varying from 18*s.* 8*d.* to 23*s.* 4*d.* per ton, with an additional charge of 12*s.* per ton per trip for locomotive power, and a minimum load of 50 cwt. per wagon. The carriers made their own charges to the public.

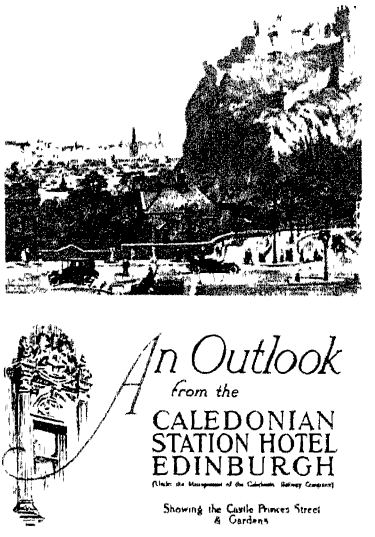
Grand Junction Railway.—In 1838 maximum tolls were in operation for the use of the line varying from 1*d.* to 3*d.* per ton per mile, but no maximum rates were prescribed when the company acted as carriers, the only stipulation being that reasonable charges might be made in addition to the tolls for the use of the railway. In practice the classification of goods dated 24th October, 1838, consisted of 194 entries ranged into seven classes, the charges from Birmingham to Liverpool or Manchester varying from 1*s.* 3*d.* per cwt. for the heavier classes of commodities such as ale and porter in casks, bacon and hams, cider, grindstones, lead in casks, &c., to 5*s.* per cwt. for such goods as baskets, boxes of millinery, and hats in cases. The private carriers on this railway charged the same rates as the railway company, being allowed a reduction of 20 per cent to compensate them for the terminal services they performed.

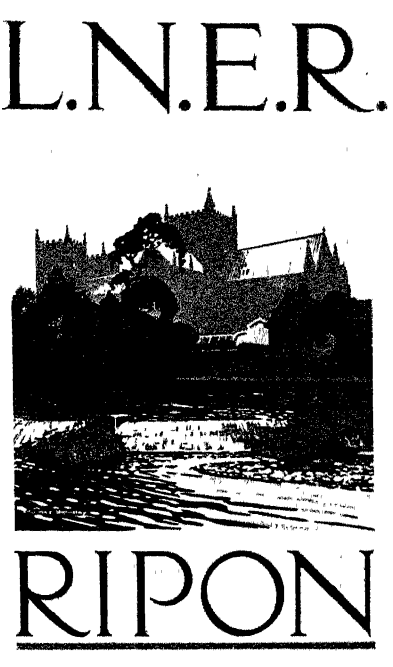
Liverpool and Manchester Railway.—The maximum rates provided by the special Act 7 Geo. c. 49 for the carriage of merchandise by the company as carriers between Liverpool and Manchester varied from 8*s.* to 14*s.* per ton.

The actual rates charged were as follows:

Paving stones	6*s.* 8*d.* per ton.
Stones, slates, timber staves, and deals ..	8*s.* ,,
Sugar, corn, grain, and flour	9*s.* ,,
Dyewoods and lead	8*s.* 4*d.* ,,
Iron	7*s.* 6*d.* ,,
Cotton manufactured goods, hides, drugs, and groceries	10*s.* ,,
Other wool	10*s.* to 11*s.* per ton.
Wines and spirits	10*s.* 10*d.* ,,
Glass	14*s.* ,,







RAILWAY POSTERS—II

[*Facing p.* 160, *Vol. I*

Early Parliamentary Action.—It has been seen that the fundamental idea of a railway was that of a public highway, and in the early Acts powers were given to owners of property adjoining the railway to lay down branch lines opening into the main lines. This enabled carriages and wagons drawn by locomotive engines or by other mechanical or animal power to pass over the railway to private sidings. Experience, however, showed that the exercise of such powers was not unattended with danger to the public using the railway. In the Railway Regulation Act of 1842 power was given to the Lords of the Committee of Her Majesty's Privy Council appointed for trade (afterwards the Board of Trade) to control the conditions under which such connections might be made to a passenger railway, where it appeared that danger might result by the exercise of these facilities.

The numerous bills for railway construction and the amount of time involved by Parliamentary Committees resulted in a codification of the clauses commonly inserted in each special Act, which were embodied in three statutes passed in 1845, viz. The Companies' Clauses Act, the Land Clauses Act, and The Railway Clauses Act. The two former have no connection with this article, but the latter contains some clauses which it will be necessary to notice. By this Act a list of all tolls authorized by the special Act must be exhibited on a toll board at each station, and milestones set up each quarter of a mile along the railway denoting the distances. The openings in the rails for private siding connections were to be made at the expense of the owners, the railway company not being bound to make such openings at any place which they had set apart for a specific purpose nor upon any inclined plane, bridge, or in any tunnel. It was also made lawful for the companies to refuse to carry dangerous goods. Power was further given enabling them to vary their tolls, so as to accommodate them to the circumstances of the traffic—provided this did not involve undue preference—and enjoining that all persons be charged alike for the conveyance of the same description of goods over the same portion of the railway. The 86th Section authorizes the railways to act as carriers, but this power is not obligatory. Various other clauses were inserted enabling the companies to safeguard themselves from fraud by senders wrongly describing the nature of the merchandise, or the weight of same, and creating a general lien for unpaid tolls. The word "toll" in this Act was defined as including any rate or charge or other payment payable under the special Act for any passenger, animal, carriage, goods, merchandise, articles, matters, or things conveyed on the railway.

The year 1854 marked a fresh step in railway legislation. The Railway and Canal Traffic Act provided that the companies should afford all reasonable facilities for the receiving, forwarding, and delivering of goods, and those owning or working lines forming a continuous communication should give reasonable facilities for the exchange of traffic. Undue preference was prohibited, and provisions were inserted limiting the liability of the companies for the conveyance of live-stock to £50 per horse, £15 per head

of cattle, and £2 per head of sheep or pigs, unless declared as of higher value and insured. The Court of Common Pleas was charged with the administration of this statute. While this Act provided for an interchange of traffic facilities between the railways, it was not till 1873 that through booking facilities were definitely ordered. The Regulation of Railways Act, 1868, extended the provision of the Act of 1854 to traffic carried in steam-driven vessels owned or worked by them. It also enacted that where any charge had been made by a company in respect of the conveyance of goods over the railway, on application in writing within one week after payment of the charge, by the person by whom it was paid, the company must render an account within fourteen days. The account is required to show how much of the charge was for conveyance, including tolls for the use of the railway, for carriages, and for locomotive power, and how much of such charge was for the terminal services of loading and unloading, covering, collection, delivery, and other expenses, but without particularizing the items of which the latter consisted. The Act also provided that where two railways were worked by one company, the calculation of tolls and charges over the distances traversed on both railways shall be reckoned continuously as if they were one railway.

Work of the Railway Commissioners.—Hitherto the tribunal for dealing with disputes arising out of the Act of 1854 was the Court of Common Pleas, but the Railway Regulation Act of 1873 established a new tribunal bearing the title of the Railway Commissioners. The court consisted of three persons, including one of experience in the law and one in railway business. To them were transferred the duties devolving on the Court of Common Pleas under the Act of 1854. The Commissioners also had power to compel the forwarding of traffic over two or more railways at through rates, but this power could only be set in motion by the companies themselves. Provision was made for the rate books to be open to public inspection, and upon application being made to the Commissioners the railway companies could be required to dissect rates, and to distinguish in the rate books how much of each rate was for conveyance and how much for other expenses, specifying the nature and detail of such other expenses, the penalty for non-compliance with this section being £5 per day. The Commissioners were also empowered to decide what was a reasonable sum for terminals where such had not been fixed by Act of Parliament.

The constitution of the court did not, however, give satisfaction to the traders, its decisions being open to review by superior courts, but the tribunal, which was established for five years only, continued to exercise its powers up to 1888, being perpetuated by successive Expiring Laws Continuous Acts.

Revision of Maximum Rates.—We have seen that in the early days of railways the idea existed of a public highway over which carriers or other persons might run their vehicles subject to payment of tolls for the use of the road, and it is important to bear this point in mind in order that the relative positions of the public and the railways may be appreciated.

In delivering judgment in Hall & Co. *v.* L. B. & S. C. (5 R. & C. T. C., p. 33), Mr. Justice Wills said:

"The notion of the railway being a highway for the common use of the public, in the same sense that an ordinary highway is so, was the starting-point of English railway legislation. It is deeply engrained in it. In the early days of railways it was acted upon at least occasionally, and in respect of goods traffic, and although it enters but slightly into modern railway practice, no proper understanding of a good deal of our railway legislation, and pre-eminently of clauses relating to tolls or charges, can be arrived at, unless it is firmly grasped and held steadily in view. Three states of things were from this point of view to be expected and to be provided for by legislation. The company might be merely the owners of a highway, and toll takers for the use of it by other people with their own carriages and locomotives. That state of things would be worked out by the railway company possessing the mere line of railway from end to end, and by persons making use of it, buying or renting contiguous land whereon to keep their rolling stock, and have their offices, availing themselves of the powers of Section 76 of the Act of 1845 and getting on the railway by means of sidings connected with the railway.

"A second state of things, as we know from the evidence in this case to which by consent of the parties we are at liberty to refer, prevailed extensively for many years after the railway system was in full operation, and for some years at least after the passing of the Act of 1845. The railway company provided the line, and provided the engines and trucks, but they were not carriers. The large warehouses and sheds, wherein goods were received, sorted, loaded, covered, checked, weighed, and labelled, and trucks or carriages marshalled, and prepared for convenient removal to their various places of destination—a corresponding work was done in respect of goods arriving from a distance—the staff of clerks, book-keepers, porters, workmen, and horses necessary for these operations were all provided and maintained at the expense of the carrier, and no portion of it fell upon the company. The company, on the other hand, as owners of the rolling stock, for the use of which, as well as of their railways, they received payment, provided whatever accommodation they needed in order to keep in convenient proximity to the places where the carrier had his depots the necessary supply of rolling stock.

"The third state of things which might exist simultaneously with the second, or might be the one prevailing exclusively on a particular line, existed where the company themselves were the carriers of the goods, and when as carriers they provided the accommodation and performed the services above described.

"The company might thus be (1) toll takers and neither conveyors nor carriers, (2) conveyors but not carriers, (3) carriers."

From 1845 to 1888 the special Acts under which each line was constructed contained maximum rate clauses, the several charges including payment for the use of the highway, for locomotive power and wagons. In later Acts provision was made enabling the companies to charge an additional sum for "collecting or delivering goods, and other services incidental to the business of a carrier". This clause became necessary owing to the companies having in many cases taken over the duties formerly performed by the carriers in the early days.

In 1888 the Board of Trade collated and published a return showing

the maximum rates, extracted from the numerous Acts passed up to this time, in the form of a Blue Book of 207 pages. During this year the Railway and Canal Traffic Act was passed, partly with a view of remedying what were considered to be defects in earlier enactments, but chiefly to alter the status of the Railway Commission Court and to codify the maximum rate clauses.

The Act of 1888 constituted the Commission as a Court of Record with a power of appeal direct to the High Court of Appeal on questions of law only. Three ex-officio Commissioners were to be appointed, one each for England and Wales, Scotland, and Ireland, these being judges of the High Court and holding office for a period of not less than five years. Two appointed Commissioners made up the court, the latter to assist in Scottish and Irish cases as well as English.

Chambers of Commerce or Agriculture, and Associations of Traders were enabled to bring cases before the Commission, which was charged to administer the Acts of 1854 and 1873 in regard to undue preference, through rates, &c. We have seen that the Act of 1854 required the companies to give reasonable facilities for the interchange of traffic, but made no mention of through rates. The Act of 1873 only remedied this to the extent of enabling the forwarding railway companies to propose through rates to the receiving railways, but the legislation of 1888 extended this facility to " any person interested in such traffic ", subject to determination in case of dispute by the Commissioners themselves. Many miscellaneous provisions were inserted in the Act, amongst others the following:

1. In cases of undue preference the burden of proof as to difference in treatment was placed on the railway companies.
2. No difference to be made in the rates for home or foreign merchandise in respect of the same or similar services.
3. Higher charges should not be made in respect of merchandise of a like description or quantity carried over a shorter distance.
4. The extension of the law of undue preference to traffic carried by sea in vessels owned, chartered, or worked by the companies.
5. Permitting uniform rates to be charged from a group of stations in the same district in reasonable proximity, to any destination point or vice versa.
6. Complaints of unreasonable treatment might be made to the Board of Trade, who should act as mediators.
7. The classification of merchandise and rate books were to be open to inspection within reasonable hours at each station.
8. The company shall, within one week after application in writing to the secretary, render an account distinguishing terminals from conveyance charges, where traffic has been, or is intended to be, carried over the railway.
9. All increases of rates were to be published, as prescribed by the Board of Trade, fourteen days before giving effect to the increase.

The codification of the rates was carried out as follows. Each railway company was required to submit to the Board of Trade a revised classification of merchandise, and a revised schedule of rates and charges pro-

posed to be charged, showing also the nature and amount of all terminal charges, and the circumstances under which they were proposed to be made. These, together with the objections by the traders, were lodged with the Board of Trade, who were required to hear such objections, and determine what classification and schedule of maximum rates ought in its opinion to be adopted by each company.

The inquiry was conducted by Lord Balfour of Burleigh and Mr. Courtenay Boyle, and after a protracted hearing lasting sixty-six days, schedules of maximum rates, and a classification common to all companies, were drawn and submitted to Parliament. These were remitted to a Select Committee of both Houses with the Duke of Richmond and Gordon as chairman, and a further inquiry took place which lasted sixty-seven days, terminating on 5th May, 1892. The schedules were again revised and afterwards presented to Parliament in the form of Provisional Order Bills, the larger companies being dealt with first, their schedules being confirmed by Parliament in August, 1891, and those for the smaller companies in 1892.

After the passing of the Confirmation Acts the companies set to work to revise the working rates in the light of the new schedules, as the new rates were to come into force on 1st January, 1893. The magnitude of the task may be appreciated from the fact that one company (G. N. R.) had between 13,000,000 and 14,000,000 rates on their books, and only one-third to one-fourth of these were local to the G. N. R., the remainder consisting of through rates with other companies, many of whose schedules were not confirmed till 1892.

When the new rates came into operation, the companies had to fall back on the class rates for charging purposes where exceptional rates applying to particular commodities had not through lack of time been provided, and this led to an outcry from the traders. A committee of the House of Commons was appointed to investigate the matter on 22nd August, 1893, and as a result the Railway and Canal Traffic Act of 1894 was passed. The object of this Act was to prevent the railway companies from unduly raising their rates, either directly or indirectly, above those in force on 31st December, 1892, notwithstanding that such increased rates might be within the maxima allowed by the new Confirmation Acts. The Railway and Canal Commission were charged with the duty of deciding whether the increase in any case brought before them was reasonable. The court was also given power to adjudicate in cases of dispute as regards terminal charges included in private siding rates. The Act had the effect of making the companies cautious in quoting reduced rates to encourage new traffic, because if the reductions did not achieve the desired result, the companies might be met with the difficulty of increasing the rates after they had reduced them.

Two decisions of importance in 1901 and 1902 led to the passing of the Railway (Private Sidings) Act, 1904, viz. Cowan & Sons *v.* N. B. R., tried in the Court of Session, on appeal from a decision by the Railway and Canal Commission (11 R. & C. T. C. 96), and the Lancashire Brick and Terra

Cotta Co., Ltd., *v.* L. & Y. R., tried in the Court of Appeal (11 R. & C. T. C. 138). Briefly, the effect of these decisions was that the receiving, forwarding, and delivering of traffic at a private siding were facilities which the Railway and Canal Commission could not order a railway company to afford, and that the powers of owners of land adjoining the railway conferred by Section 76 of the Railway Clauses Act, 1845, were for the purpose of enabling such owners to bring their engines and carriages on to the railway as a highway. In giving judgment in the former case in the Court of Session, Lord Justice Clerk said:

" The statutory provision by which a citizen can have a connection established with the public railroad, was part of the railroad scheme at the time at which the Act was passed, viz. that the citizen should have a right to use the road with his own haulage and wagons on paying the proper tolls to the railroad company. That was the purpose of conferring upon him the right to have a siding. He had no right to require the company to haul to his siding and deliver there, or to call at his siding to take up wagons."

The object of the Private Sidings Act, 1904, was therefore to enable the owners of such sidings to claim facilities for the collection or delivery of their traffic by the railway company's engines at such places. The use of the railway as a highway for the passage of their own trains was impossible in the absence of facilities for the working of points and signals (Powell Duffryn Steam Coal Co. *v.* Taff Vale Co., 43 L. J. Ch. 575).

Railway and Canal Traffic Act, 1913.—The condition of the settlement of the railway strike in August, 1911, necessitated further legislation on the subject of the railway rates. One of the terms of settlement was an undertaking given by the Government to the railways as follows:

" The Government will propose to Parliament next session legislation providing that an increase in the cost of labour due to an improvement of conditions for the staff would be a valid justification for a reasonable general increase of charges within the legal maxima if challenged under the Act of 1894."

A Bill was introduced into Parliament in 1912 to give effect to this undertaking, but it also included a number of other provisions, and owing to opposition was withdrawn, an amended Bill being subsequently introduced limited to the undertaking given by the Government, and becoming law on 7th March, 1913. Briefly, this Act enabled the railway companies to raise their rates within the maxima laid down by the Provisional Order Confirmation Acts previously referred to, and the subsequent Act of 1894, to cover the increased cost due to the improved labour conditions of the railway staff. As a result of this legislation the railway companies gave public notice on 15th May, 1913, of their intention to raise certain of their rates on 1st July following, to the extent of 4 per cent to meet the increased cost of working due to the settlement of the labour dispute.

Ministry of Transport Act, 1919.—This Act is fully discussed in

the article "Administrative Reorganization of the Railways following the War" (Vol. II, p. 254), to which the reader is referred. The Minister in charge of the department was empowered to make such charges in respect of railway traffic as he might deem expedient. A new body was set up at the same time, called the Rates Advisory Committee (see Vol. II, p. 268). This body was charged with the duty of advising the Minister as to the revision of rates necessary to meet the increase of revenue consequent on the heavy post-war increase in expenditure.

Railway Act, 1921.—This Act also is fully dealt with in Vol. II, p. 268. The most important provisions are contained in Sections 20 to 61 of the Act. Hitherto the companies had been allowed to fix their own rates within the maxima laid down by the various Railway Order Confirmation and Canal Traffic Acts, 1894 and 1913; but by the Act the standard charges were fixed by the Rates Tribunal.

CHAPTER II

The Classification of Goods Traffic

In the early days of railways before through rates existed between two or more companies, each railway had its own classification of goods for the purpose of basing its charges. These were in the main enlargements of the classification embraced in the special Act authorizing the construction of the line. As through booking became general a common classification was ultimately adopted, which was gradually added to up to the end of 1892. The classification grouped the commodities into seven classes, viz. mineral class, and special class, for merchandise conveyed in full truck loads, with five classes chiefly applicable to small consignments which travelled in less than 2- or 4-ton lots. During the Parliamentary revision of rates in 1889 and 1890 the classification was amended, and the two truck load classes were divided into three classes, lettered A, B, and C, the five classes for small consignments being retained. This classification was further revised by the Rates Advisory Committee in 1923 in accordance with Section 29 of the Railways Act of 1921, and the groups of commodities increased from 8 to 21 classes, the splitting of the classes being shown in table on p. 168.

The new classification, consisting of 99 pages, is too voluminous to reproduce here, but it proceeds on the lines of the earlier classifications, in so far as it recognizes the principle of goods being charged according to their value and bulk as compared with weight. Classes 1 to 6 are mainly confined to minerals; classes 7 to 10 to food-stuffs and goods in the first process of manufacture, &c.; classes 11 to 20 according to value, bulk, and liability to damage; while class 21 embraces gold and silver articles,

Classification as revised in 1889 and 1890.		New Classification.		
Class.		Class.	Applicable, unless otherwise specially stated, to consignments of:	
A	4 tons and upwards	1	6 tons and upwards	In owners' wagons.
		2	6 ,, ,,	
B	4 tons and upwards	3	6 tons and upwards	
		4	6 ,, ,,	
		5	6 ,, ,,	
		6	6 ,, ,,	
C	2 tons and upwards	7	4 tons and upwards	
		8	4 ,, ,,	
		9	4 ,, ,,	
		10	2 ,, ,,	
1	Any quantity	11	2 tons and upwards	In railway company's wagons.
		12	Any quantity	
		13	,,	
2	Any quantity	14	Any quantity	
		15	,,	
		16	,,	
3	Any quantity	17	Any quantity	
		18	,,	
4	Any quantity	19	Any quantity	
5	Any quantity	20	Any quantity	
	Special	21	Any quantity	

platinum, and statuary. The method adopted can be most readily seen by taking iron and steel manufactures, as follows:

Class 1	Iron ore.
,, 5	Pig-iron.
,, 6	Blooms and billets.
,, 7	Iron rods, hoop iron, and tubes.
,, 11	Axle boxes, springs.
,, 12 and 14 ..	Machines and machinery.
,, 18	Hardware and hollow-ware.
,, 20	Bicycles and tricycles.

The working classification has hitherto differed somewhat from the Parliamentary classification embraced in the various Rates and Charges Order Confirmation Acts. The latter prescribed the maximum classes for the various descriptions of merchandise which the railway companies might, but not necessarily must, charge, and was drawn up as simply as possible to avoid cause for dispute. The necessities of trade, however, prevented this being closely adhered to in practice, hence the finer subdivisions which were made in respect of packing or value of the merchandise. A striking example of this is timber, which was comprised under two headings in the Parliamentary classification compared with two pages in the working classification.

The new classification determined by the Rates Advisory Committee is based on the old working classification, and constitutes not only the

maximum but the actual working classification for use in connection with the new standard rates.

In considering the class to which each of the various descriptions of goods must be assigned, regard is had to at least four principal factors, viz. (*a*) value, (*b*) method of packing, (*c*) bulk in proportion to weight, (*d*) liability to damage in transit. In addition to these, commodities used for similar purposes are usually classified in the same group, e.g. butter and margarine in casks or cases, class 14; lard or lard substitutes and dripping in casks or cases, class 14; barley, oats, and wheat, class 8. In regard to packing, common folded garden chairs and seats when fitted up in cases are classified 18, but when sent in parts in cases, class 13. Hay and straw, ensilage, fern for litter or packing, esparto grass, and china grass are classified according to the weight that can be loaded in each truck, as follows:

Minimum 2½ tons per truck	Class 10
Minimum 2 tons per truck	,, 12
Minimum 30 cwt. per truck	,, 15
Less than 30 cwt. per truck	,, 18

The influence of the value of the merchandise governing the classification may also be illustrated by tubes, as follows:

Iron or steel not coated	Class 7
Brass	,, 14
Bronze	,, 16
Copper or nickel	,, 18

Objection has sometimes been taken that certain articles are included in the same class as goods of greater value. While value is a determining factor, it must be realized that it is impossible to adhere too strictly to this principle. An important feature is the necessity for avoiding trade technicalities, and any endeavour to make distinction between goods of the same description, but of different qualities, would pave the way for misdeclaration and dispute. It is highly important that the railway staff who have to handle the goods should be able to distinguish between the different kinds of merchandise, so as to determine to which class they belong without the necessity of calling in a trade expert.

The feature of liability to damage includes not only (1) the risk of damage to the commodity itself, but (2) to merchandise which is liable to damage other goods loaded with it. In the former case cheese when packed in casks or cases is in class 14, but when sent loose unpacked, class 18, and soft cheese not properly protected by packing is only conveyed as damageable goods. In the latter case paints and colours in casks or iron drums are placed in class 15, but when conveyed in jars in class 19. In certain cases packages containing mixed articles are specially provided for to meet trade requirements, e.g. mixed drapery, mixed groceries, mixed packages of hardware, druggists' sundries, builders' implements, and saddlers' sundries. In effect, therefore, the classification is the channel by means of which the cost of railway transport is apportioned amongst the

various commodities as far as possible according to their ability to contribute the revenue for working the railway, as well as to cover the risk of damage or loss.

CHAPTER III

The Class Rates

It has been seen that by the Railway Clauses Act, 1845, within the limits of the maximum rates the companies might vary their charges to meet the requirements of the traffic, and it may be noticed in passing that the 86th Section, while enabling the railway to become carriers, required it to make reasonable charges not exceeding the tolls authorized by each special Act. The precise meaning of this clause does not seem to have been determined. Sir William Hodges, C.J., in his book on *Railways* (Vol. I, p. 448), expressed the view that all charges within the maximum were open to dispute, though this interpretation was not accepted by the companies. The point was, however, subsequently settled by the 10th Section of the Railway and Canal Traffic Act, 1888, prescribing that the rates mentioned in the Rates and Charges Order Confirmation Acts shall be the charges which the companies are entitled to make.

The actual rates are for convenience divided into two categories, viz. (1) class, in future to be known as standard rates; (2) exceptional rates. The classification applies to the former only, the exceptional rates being quoted to apply to particular descriptions of traffic between particular points, and these have in the past been coupled either with or without conditions as to quantity, risk, or both. It will therefore be necessary to deal with each category separately, and, while showing the composition of the class or standard rates, to refer briefly to the circumstances calling for exceptional figures.

We have seen that in the early period of railway organization the goods were collected and delivered by independent carriers, the tolls for the use of the railway being paid by the carriers, who, in addition, collected from the public their own charges for the accommodation provided and the various services they performed at the terminal points, such as loading and unloading, collection, and delivery. For example, the charges on the London and Birmingham Railway between Camden and Curzon Street on 1st August, 1845, were as follows, inclusive of locomotive power and wagons:

		s.	d.
Second Class.	1¼*d.* per ton per mile, 112 miles ..	11	8
	Pickford & Co.'s charge for terminals	8	10¼
	Total	20	6¼
		s.	d.
Third Class.	1½*d.* per ton per mile	14	0
	Pickford & Co.'s charge for terminals	10	7½
	Total	24	7½

		s.	d.
Fourth Class.	2*d.* per ton per mile	18	8
	Pickford & Co.'s charge for terminals	14	2
	Total	32	10

		s.	d.
Fifth Class.	2½*d.* per ton per mile	23	4
	Pickford & Co.'s charge for terminals	17	8½
	Total	41	0½

NOTE.—The first class, 1*d.* per ton per mile, including locomotive power but exclusive of wagons, applied to coal conveyed by coal trains.

Through Rates.—Up to 1865 the rates between two or more companies were arranged by correspondence. This, however, was found to be an inconvenient method which lead to delay, and a conference of the principal English companies north of the Thames met at Normanton in that year, for the purpose of arranging through rates by personal communication. The companies were to a large extent guided by their own local scales, which were found to involve considerable difficulty, and ultimately, in 1874, a table of class rates was adopted, proceeding by gradations of 5 miles up to 200 miles, and thence by 10 miles up to 300 miles. By this arrangement the quotation of rates was much simplified and correspondence reduced. The Board of Trade adopted this scale as the basis on which to codify the maximum rates in 1889, although, as will be noticed, the revised powers proceeded on a purely mileage scale, which involved increases in the existing rates in some cases and decreases in others.

From January, 1893, the class rates have been based on the maximum powers of each company, subject to modifications involved by the Railway and Canal Traffic Act, 1894. The general scale of the London and North-Western Railway was as follows:

Class.	Maximum Rates for Covneyance per Ton per Mile.				Station Terminal at each end.	Service Terminals.			
	First 20 Miles.	Next 30 Miles.	Next 50 Miles.	Remainder of Distance.		Loading.	Unloading.	Covering.	Uncovering.
	d.	*d.*	*d.*	*d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*d.*	*d.*
A	0·95	0·85	0·50	0·40	0 3	—	—	—	—
B	1·25	1·00	0·80	0·50	0 6	—	—	—	—
C	1·80	1·50	1·20	0·70	1 0	0 3	0 3	1	1
1	2·20	1·85	1·40	1·00	1 6	0 5	0 5	1·50	1·50
2	2·65	2·30	1·80	1·50	1 6	0 8	0 8	2	2
3	3·10	2·65	2·00	1·80	1 6	1 0	1 0	2	2
4	3·60	3·15	2·50	2·20	1 6	1 4	1 4	3	3
5	4·30	3·70	3·25	2·50	1 6	1 8	1 8	4	4

In addition to the above, special maximum rates were provided for traffic

in classes A and B over certain portions of the line where a heavy mineral traffic was carried.

It should also be noted that the provision of trucks was not included in the maximum rates for class A (North-Eastern and Scottish Railways excepted), and the following maximum charges were fixed for wagon hire where the company supplied the wagons (Midland and North Stafford Railways excepted, where the initial charge was 6*d.* for 50 miles):

	s.	*d*	
For distances not exceeding 20 miles		4½	per ton.
For distances exceeding 20 but not exceeding 50 miles		6	,,
For distances exceeding 50 but not exceeding 75 miles		9	,,
For distances exceeding 75 but not exceeding 150 miles	1	0	,,
For distances exceeding 150 miles	1	3	,,

The maximum rates for classes A, B, and C varied as between certain of the companies, and the companies south of the Thames were given higher charging powers for classes 1 to 5, while variations were made in the case of the Scottish companies.

The Confirmation Acts also provided maximum rates for various kinds of returned empties, live-stock, and carriages not suitable for running on the railway. For the first time also maximum charges were provided for perishable merchandise by passenger train, including butter, cheese, cream, eggs, fish, fruit, game, meat, poultry, rabbits, and vegetables (hot-house), together with milk, and returned milk empties.

No maximum charges were provided to cover the cost of collection and delivery at the terminal stations, but Clause 5 of the Order Confirmation Act provided that the company might charge a reasonable sum for these services, when rendered to a trader at his request or for his convenience, by way of addition to the tonnage rate. Any difference arising under this section to be determined by an arbitrator to be appointed by the Board of Trade at the instance of either party.

In order to calculate the maximum charging powers between terminal stations on two companies' lines which are known as " through " rates, as distinguished from local rates over one company's system only, it was necessary to ascertain the distance by the shortest route over each company's line separately. The conveyance rates over each company's section of the route were tolled separately, the charges for the terminal services at both ends plus a reasonable sum for the cost of collection and delivery being added to form the total rate. The same method was employed where the route was over three or more companies' systems. It may be noticed, however, that in the case of through rates the lowest charge was not always to be obtained by taking the shortest route. It was sometimes more advantageous to adopt an alternative though slightly longer route, if the number of interested companies could thereby be reduced. By this means the disadvantage of a number of short distance tolls was overcome.

While the Order Confirmation Acts definitely prescribed maximum charges, the legislation of 1894 and 1913 left an indefinite state of things,

as far as the actual amounts of the rates were concerned. The elements of reasonableness or unreasonableness came in where the 1893 rates exceeded those in force in 1892, and the Railway and Canal Commission were constituted the arbiters in case of dispute. The Act of 1894 further provided that in cases of dispute as to terminal allowances on traffic to and from private sidings, the Commission should have power to hear and adjudicate on same.

Schedules of Proposed Standard Charges.—At the time of writing, the schedules of the proposed standard charges submitted by the four railway groups to the Railway Rates Tribunal under the provisions of Section 30 of the Act of 1921 have not been adjudicated upon, but the following scales from the London Midland and Scottish Railway Company's schedule may serve to illustrate their proposals.

Similar schedules with slight variations apply to the other groups.

1. Goods and minerals except coal, coke, and patent fuel.
   (*a*) England and Wales. (*b*) Scotland.
2. Coal, coke, and patent fuel.
   (*a*) England and Wales. (*b*) Scotland.
3. Returned empties.
4. Rolling stock by merchandise train.
5. Animals by merchandise train.
6. Carriages by merchandise train.
7. Small parcels by merchandise train.
8. Additional charges on heavy articles in excess of 12 tons each.
9. Wagon hire.
10. Insurance of traffic described in the Carrier's Act of 1830 or amending Acts.

Short-distance Clause.—The minimum distance for charging purposes has been fixed by the Rates Tribunal as 6 miles where the conveyance is only upon the railway of one company, but where the traffic travels over two companies' lines a minimum distance of 9 miles applies.

Continuous Mileage.—As we have seen, the application of the maximum rates under the Confirmation Acts of 1891 and 1892 involved the tolling of the conveyance rates separately over each of the companies' systems over which the traffic travelled, but with the amalgamation of the principal systems into four groups provision was made under Section 47, Subsection 7, for continuous mileage to be adopted. This is a method entailing a considerable loss of revenue but simplifying the calculation of the rates, no transmission charges for the expense of exchanging goods from one normal gauge railway system to another being made in this country.

Mileage Gradations.—The mileage gradations of the scales for merchandise have been unified, the initial figure of 20 miles being adopted for merchandise other than coal, coke, and patent fuel, and two periods of 10 miles each for the first 20 miles for the latter commodities, instead of the variations provided for in the Confirmation Order Acts of 1891 and 1892.

SCALE OF CHARGES IN RESPECT OF GOODS AND MINERALS, EXCEPT COAL, COKE, AND PATENT FUEL, BY MERCHANDISE TRAIN

Applicable to Traffic elsewhere than in Scotland

Class in Respect of Merchandise to which Charges are Applicable.		Standard Rates for Conveyance per Ton per Mile.				Standard Terminals per Ton				
		For the first 20 Miles or any part of such Distance.	For the next 30 Miles or any part of such Distance.	For the next 50 Miles or any part of such Distance.	For the remainder of the Distance	Station Terminal at each end.	Service Terminals.			
							Loading.	Unloading.	Covering.	Uncovering
		d.	*d.*	*d.*	*d.*	*s. d.*	*s. d.*	*s. d.*	*d.*	*d.*
1	In Owners' Wagons	1·90	0·95	0·55	0·50	0 3	—	—	—	—
2		2·15	1·05	0·70	0·65	0 5	—	—	—	—
3		2·25	1·10	0·80	0·70	0 6	—	—	—	—
4		2·30	1·20	0·90	0·75	0 10	—	—	—	—
5	In Railway Wagons	2·60	1·25	0·95	0·75	0 6	—	—	—	—
6		2·65	1·35	1·05	0·80	0 10	—	—	—	—
7		2·90	1·60	1·20	0·95	1 0	—	—	1·25	1·25
8		3·05	1·75	1·35	1·00	1 2	—	—	1·25	1·25
9		3·20	1·90	1·50	1·05	1 4	—	—	1·50	1·50
10		3·50	2·30	1·75	1·10	1 7	—	—	1·50	1·50
11		3·75	2·55	2·10	1·45	2 0	0 6	0 6	2·50	2·50
12		3·90	2·70	2·25	1·60	2 5	0 8	0 8	2·50	2·50
13		4·25	2·90	2·50	1·75	2 5	0 8	0 8	2·50	2 50
14		4·55	3·20	2·65	2·10	2 5	0 10	0 10	3·00	3·00
15		4·80	3·45	2·95	2·30	2 5	0 11	0 11	3·00	3·00
16		5·05	3·70	3·20	2·65	2 5	1 1	1 1	3·00	3·00
17		5·50	4·15	3·35	2·90	2 5	1 4	1 4	3·00	3·00
18		5·85	4·50	3·70	3·20	2 5	1 7	1 7	3·00	3·00
19		6·80	5·30	4·40	3·85	2 5	2 2	2 2	5·00	5·00
20		8·00	6·25	5·75	4·40	2 5	2 8	2 8	6·00	6 00
21		12·00	9·35	8·65	6·55	3 7	4 0	4 0	9·00	9 00

Fractions of less than one halfpenny in the rate to be dropped, and fractions of one halfpenny or over to be charged as one penny

SCALE OF CHARGES (INCLUSIVE OF TERMINALS) FOR RETURNED EMPTIES BY MERCHANDISE TRAIN

Distance.	Class A.	Class B.	Class C.	Class D.	Class E	Class F.	Class G.
	Per Cwt.	Per Cwt.	Per Cwt.		Per Cwt.	Per Cwt	Per Cwt.
	s. d.	*s. d.*	*s. d.*		*s. d.*	*s. d.*	*s. d.*
Not exceeding 25 miles.	0 2	0 2	0 4		0 4	0 8	0 8
Exceeding 25 but not exceeding 50 miles	0 3½	0 3½	0 7		0 7	1 2	1 2
,, 50 ,, ,, 100 ,,	0 7	0 7	1 0		1 2	1 9	2 4
,, 100 ,, ,, 150 ,,	0 9½	0 9½	1 5	Same rate as full casks (subject to small parcels scale if applicable) or scale E if cheaper.	1 7	2 4	3 2
,, 150 ,, ,, 200 ,,	1 0	1 0	1 8		2 0	2 11	4 0
,, 200 ,, ,, 250 ,,	1 2½	1 2½	1 11		2 5	3 6	4 10
,, 250 ,, ,, 300 ,,	1 5	1 5	2 2		2 10	4 1	5 8
,, 300 ,, ,, 350 ,,	1 7½	1 7½	2 5		3 3	4 8	6 6
,, 350 ,, ,, 400 ,,	1 10	1 10	2 8		3 8	5 3	7 4
,, 400 ,, ,, 450 ,,	2 0½	2 0½	2 11		4 1	5 10	8 2
,, 450 ,, ,, 500 ,,	2 3	2 3	3 2		4 6	6 5	9 0
,, 500 ,, ,, 550 ,,	2 5½	2 5½	3 5		4 11	7 0	9 10
,, 550 ,, ,, 600 ,,	2 8	2 8	3 8		5 4	7 7	10 8
,, 600 miles	2 10½	2 10½	4 0		5 9	8 2	11 6
Minimum Charge	0 4	0 4	0 4		0 4	0 8	0 8

Or as empties under the general classification subject to small parcels scale if applicable.

No less charges than as for 56 lb. Fractions of 14 lb. to be charged as 14 lb.

CLASSIFICATION OF EMPTIES

Class A. Sacks, bags, meat wrappers and cloths, wool sheets for lining trucks in which wet pelts or spetches are to be carried.
,, B. Fish empties other than in class A.
,, C. Flower, fruit, and vegetable empties other than in class A.
,, D. Ale and porter casks.
,, E. Other returned empties not specially provided for.
,, F. Carboys.
,, G. Hat crates, earthenware crates, &c.

SCALE OF CHARGES IN RESPECT OF ANIMALS BY MERCHANDISE TRAIN

Description.	Rate for Conveyance per Mile.					Service Terminals		
	For the first 20 Miles or any part of such Distance.	For the next 30 Miles or any part of such Distance.	For the next 50 Miles or any part of such Distance.	For the remainder of the Distance.	Station Terminal at each end	Loading.	Unloading.	Minimum charge as for Animals.
	Per Head s. d.	Per Head s. d.	Per Head. s. d.	Per Head. s. d.	Per Head. s. d	Per Head. s. d	Per Head s. d.	
Horses, Ponies, Mules, or other Beasts of draught or burden, exceeding 12 hands high, each	0 4 90	0 3·85	0 3·35	0 2·90	0 10	0 6	0 6	Three
	Per Truck. s. d.	Per Truck. s. d	Per Truck. s. d	Per Truck. s. d.	Per Truck. s. d	Per Truck s. d.	Per Truck. s d	
Horses, Ponies, Mules, or other Beasts of draught or burden, not exceeding 12 hands high :—								
For each part truck load ..	0 10·80	0 8·55	0 7·60	0 6·70	2 2	1 1	1 1	—
,, small ,, ...	1 2·10	0 11 10	0 9 60	0 8·55	2 2	1 5	1 5	—
,, medium ,, ...	1 4·25	1 0 80	0 11 10	0 9·60	2 2	1 7	1 7	—
,, large ,, ...	1 6·75	1 2·95	1 0·90	0 11·10	2 2	1 10	1 10	—
Oxen, Cows, Bulls, Neat Cattle, Calves, Sheep, Lambs, Goats or Pigs :—								
For each part truck load ..	0 8·10	0 6·40	0 5·70	0 5·05	1 7	0 10	0 10	—
,, small ,, ...	0 10·55	0 8 30	0 7·20	0 6 40	1 7	1 1	1 1	—
,, medium ,, ...	1 0·15	0 9·60	0 8·30	0 7·20	1 7	1 2	1 2	—
,, large ,, ...	1 2·10	0 11·20	0 9·70	0 8·30	1 7	1 4	1 4	—

Fractions of less than one halfpenny in the rate to be dropped, and fractions of one halfpenny or over to be charged as one penny

SCALE OF CHARGES IN RESPECT OF SMALL PARCELS (OTHER THAN RETURNED EMPTIES) BY MERCHANDISE TRAIN

For small parcels not exceeding in weight 3 cwt. by merchandise train, the company may charge, in addition to the authorized conveyance and terminal charges, the following sums:

	Per Ton.	Additional Charge per Consignment.
On rates not exceeding ..	10*s.*	4*d.*
,, ,, ..	20*s.*	5*d.*
,, ,, ..	30*s.*	6*d.*
,, ,, ..	50*s.*	7*d.*
,, ,, ..	70*s.*	8*d.*
,, ,, ..	100*s.*	9*d.*
Exceeding	100*s.*	10*d.*

Fractions of 14 lb. to be charged as 14 lb.

SCALE OF CHARGES IN RESPECT OF COAL, COKE, AND PATENT FUEL BY MERCHANDISE TRAIN IN OWNERS' WAGONS, APPLICABLE TO TRAFFIC ELSEWHERE THAN IN SCOTLAND

Applicable with the following minimum quantities
Coal and patent fuel, 7 tons. Coke, 4 tons.

Standard Rates for Conveyance per Ton per Mile.					Station Terminal at each end per Ton.
For the first 10 Miles or any part of such Distance.	For the next 10 Miles or any part of such Distance.	For the next 30 Miles or any part of such Distance.	For the next 50 Miles or any part of such Distance.	For the remainder of the Distance.	
d.	*d.*	*d.*	*d.*	*d.*	*d.*
2·25	1·75	1·10	0·70	0·65	5

Fractions of less than one halfpenny in the rate to be dropped, and fractions of one halfpenny and over to be charged as one penny.

Smaller quantities than 7 tons of coal and patent fuel or 4 tons of coke will be charged as follows, except that when a wagon carrying less than 7 tons of coal or patent fuel or 4 tons of coke is loaded to its full capacity, the charges will be on actual weight at the rate to which the prescribed minimum applies:

Coal and Patent Fuel.

Less than 7 tons and not less than 4 tons	At the scale for class 7 of the general classification, but not more than is charged for 7 tons.
Less than 4 tons and not less than 2 tons	At the scale for class 10 of the general classification, but not more than is charged for 4 tons.
Less than 2 tons	At the scale for class 12 of the general classification, but not more than is charged for 2 tons.

Coke.	
Less than 4 tons and not less than 2 tons	At the scale for class 10 of the general classification, but not more than is charged for 4 tons.
Less than 2 tons	At the scale for class 12 of the general classification, but not more than is charged for 2 tons.

Coal, coke, and patent fuel charged at rates for class 10 or 12 of the general classification must be packed.

Disintegration of Class and Exceptional Rates.—Much controversy and litigation has resulted in the past from the practice of fixing rates covering all terminal services, whether these were required by the trader or not. The system, however open to question, had much to recommend it. The quoting of rates including conveyance, loading, unloading, covering and uncovering, and collection and delivery in one figure saved an immense amount of work to the railway companies in charging, and to the traders in checking, where the inclusive services were rendered, instead of each service being charged for separately. The difficulty arose, where the rates were not up to the maxima laid down by the Confirmation Order Acts of 1891 and 1892, of the trader knowing what amount was included in such rates in respect of the various terminal services when he was desirous of performing these himself, particularly in the case of traffic to and from private sidings. In the case of Pidcock & Co. (9 R. & C. T. C., p. 45), the court held that in the disintegration of rates quoted below the maximum, the suggestion that these should be reduced in their component parts *pro rata* with the maximum powers was not an unreasonable one, although this ruling was afterwards modified in the case of Vickers Sons & Maxim, Ltd., *v.* Midland Railway and others (11 R. & C. T. C., p. 249).

With a view to overcoming this difficulty, Section 30 of the Railways Act, 1921, decreed that the schedule of standard charges shall show the amounts of the terminal charges separately from the conveyance rates, and Section 32 of the same Act also enacts that on and from the appointed day when the standard charges come into force, such charges "shall be the charges which that company shall be entitled to make for all services rendered in respect of which charges are fixed".

Subsection (1) of Section 40 provides that in the case of exceptional rates the tribunal in sanctioning such figures "shall determine the amounts (if any) to be included in the rate for the following services: (*a*) conveyance, (*b*) station terminals, (*c*) service terminals, (*d*) accommodation provided and services rendered at or in connection with a private siding".

Subsection (2) provides that where the railway companies grant an exceptional rate without referring to the rates tribunal, and the company shows in the quotation for the rate and in the rate book the amount (if any) included therein for such several services, the disintegration so shown shall be conclusive, unless a trader interested in the rate complains to the

Rates Tribunal that the amount allotted to any particular service is unreasonable, in which event the onus of proof shall be on the railway company.

Subsection (3) prescribes, "Where any such company granting such an exceptional rate has not distinguished in the quotation for the rate or in the rate book the amounts included therein for such several services as aforesaid: (*a*) the rate, in the case of a station to station rate, shall be deemed to be composed of conveyance rate and terminal charges, in proportion to the amounts included in the corresponding standard rate for the same service and accommodation in respect of similar goods between the same stations; and (*b*) in the case of any other rate, the company shall, within fourteen days after application in writing by any person interested in the disintegration of the rate, afford that person information of the amounts (if any) included in the rate for the several services aforesaid."

Subsection (4) enacts that any dispute as to the disintegration of any such exceptional rate shall be determined by the Rates Tribunal.

Subsection (5) rules out from any proceedings of alleged undue preference before the Railway and Canal Commission, the various component parts of any rate as shown in the rate book or determined by this section, but such question of undue preference shall be determined by reference to the total rate, unless it is proved to the satisfaction of the Commission that a consideration of the component parts would be fair and reasonable.

CHAPTER IV

Exceptional Rates

We have seen that the standard rates are coupled with the classification for charging purposes, and although the eight classes fixed by the Order Confirmation Acts of 1891 and 1892 have been enlarged by the Rates Tribunal to twenty-one classes, it is still necessary to have recourse to exceptional rates for particular commodities, which for various causes require exceptional treatment. Each of these rates has been quoted in the past mainly with reference to one description of traffic, as distinct from groups of commodities as shown in the classification for class rates, and the enormous number of such rates was the main reason for increasing the number of classes to absorb as many as possible of these in the standard scale. The Railways Act, Sections 36 to 39, made certain important provisions relative to the fixing of these charges by the amalgamated companies *inter alia*:

(*a*) All existing rates within 5 per cent of the standard rates to be cancelled.

(*b*) The continuance of an exceptional rate of 5 per cent or more below the standard rate to be the subject of an agreement in writing between the railway companies and the traders interested, or failing agreement to be referred to the Rates Tribunal for determination.

(*c*) No rate which has not been used for the charging of merchandise within two

years prior to 1st January, 1923, to be continued, unless the trader can prove to the satisfaction of the railway company, or failing agreement to the satisfaction of the Rates Tribunal, that (1) this was due to abnormal conditions of trade or (2) that a rate of equal amount to the same destination remains in operation at other stations or sidings in the same group or area.

(*d*) That all rates of more than 40 per cent below the standard rate agreed as above shall be referred to the Rates Tribunal for determination.

(*e*) All new rates granted after the appointed day shall be reported to the Minister, and shall not be less than 5 per cent or more than 40 per cent below the standard rates without the consent of the Rates Tribunal.

(*f*) If the Minister is of opinion that new rates are being granted, prejudicing any class of users not benefited by such rates, or jeopardizing the realization of the standard revenue, he may refer such rates to the Tribunal for revision, modification, or cancellation.

(*g*) A rate fixed by the Tribunal cannot be increased or cancelled without the sanction of the Tribunal.

Within the above limits the companies retain the right to fix exceptional rates below the standard or class rates, and it now remains to consider the principal factors which have hitherto caused the companies to arrange exceptional figures. Briefly, these are:

1. Competition between industrial centres to markets common to each.
2. Competition between ports and inland towns.
3. To encourage local industries.
4. Import and export rates.
5. Road and canal competition.
6. Group rates.
7. Private siding rates and station rates, exclusive of loading or unloading, &c.

A list of the principal traffics for which it has been customary to give exceptional rates was submitted to the Rates Advisory Committee on 13th May, 1920, classified as follows:

Class.	Commodities.	Including:
A	25	Coal, iron ore, limestone, sand, roadstone.
B	32	Iron or steel billets, bricks, china clay, lime in bulk, pig-iron, scrap iron, building stone, tiles.
C	36	Alkali, castings, cement, chimney pots, deals, firewood, grain, hay and straw, iron and steel goods, oil cake, packed manure, pit-wood. sanitary tubes.
1	57	Ale and porter, castings (light), cotton (raw), fresh fruit, groceries, iron and steel goods, machinery, oils, paper, soap, sugar, vegetables.
2	30	Butter, cheese, confectionery, flax, grates and ranges, common groceries, leather, machinery, wool.
3	25	Bacon and hams, bananas, castings (light), mixed groceries, market hides, hardware, hollow-ware, hops, joiners' work, stationery, tinware, woollen goods, wines and spirits.
4	4	Drugs, drapery, fresh meat, tobacco.
5	Nil	
Total,	209	

In many cases traffic in the above list under generic headings had exceptional rates that were lower than the special rates for the generic list.

Economic Principles affecting Rates.—It has been shown that class rates have hitherto been roughly divided into two parts: (1) for conveyance proper; (2) for terminals, the latter including loading and unloading, cartage, and a sum for the use of the station, clerical services, shunting, and other incidentals. In practice, exceptional rates are not built up by the allocation of a fixed sum for each service after the manner of maximum rates. A gross rate is quoted, having regard to the circumstances of the case, and the services rendered. The latter, so far as terminal services are concerned, is the same whether the traffic goes 20 or 100 miles; and while in theory the portion of the rate attributable to conveyance may be said to increase with each mile covered, the terminal portion remains stationary. The conveyance portion has to contribute to the cost of providing and maintaining the road, signalling, haulage power, and, with the exception of the traffic in classes 1 to 4, to the provision and maintenance of rolling stock. Much of the expense incidental to the maintenance of the road, bridges, &c., is incurred irrespective of the volume of traffic and is due to atmospheric conditions, as apart from wear and tear, so that the object aimed at has been to make rates conform to the requirements of trade rather than to attempt to fix them on cost of service principles. This was recognized early in railway history, Section 90 of the Railway Clauses Act, 1845, providing:

"And whereas it is expedient that the company should be enabled to vary the tolls upon the railway so as to accommodate them to the circumstances of the traffic, but that such power of varying should not be used for the purpose of prejudicing or favouring particular parties, or for the purpose of collusively and unfairly creating a monopoly either in the hands of the company or of particular parties; it shall be lawful therefore, for the company, subject to the provisions and limitations herein and in the special Act contained, from time to time to alter or vary the tolls by the special Act authorized to be taken, either upon the whole or upon any particular portions of the railway as they shall think fit; provided that all such tolls be at all times charged equally to all persons, and after the same rate, whether per ton per mile or otherwise, in respect of all passengers, and of all goods or carriages of the same description, and conveyed or propelled by a like carriage or engine passing only over the same portion of the line of railway under the same circumstances; and no reduction or advance in any such tolls shall be made either directly or indirectly in favour of or against any particular company or person, travelling upon or using the railway."

(The interpretation of the word "toll" in the Act included any rate or charge.)

In considering this question the Select Committee on Rates and Fares reported in 1882 as follows:

"There is no question as to the existence of these 'preferential' or 'exceptional' special rates; the latter epithet being the term used by representatives of the railways. The evidence given under this head comes almost entirely either from persons engaged in production who are being charged proportionately higher rates than producers resident in other parts of the country, or from towns or places

through which traffic passes, who, as engaged in the business of carrying or distribution, complain that it is diverted from them by the lower rates charged on other routes. But for the competition introduced by the low rates given by railway companies, trades would be much more local, and the trader who was nearest the market would probably make a larger profit. But on the other hand, this competition cannot but be advantageous to the public."

Exceptional rates are also given for special traffic to and from the ports, and much controversy has arisen in respect of these. Numerous complaints were brought before the Departmental Committee on Preferential Rates in 1904 and 1905 to the effect that the railway companies favoured the foreigner. A glance at the map will show that round the coast at varying distances from the industrial centres are ports competing with each other for traffic to and from the interior. As the shortest route governs the rate, rates from a competing port at a greater distance from the inland centre may be on a lower basis than from intermediate points. In their report the Committee make the following observations:

"A is a port, C is a market, B is an agricultural station half-way between A and C. There are in use rates under which the local trader at B sees foreign and colonial produce in large quantities conveyed from A to C on terms better than he can command for small quantities from B to C. From his point of view this is preference and accounts for the widespread feeling of grievance which led to the appointment of this Committee.

"This prima facie preference is justified and explained by the railway companies on the grounds of the greater bulk, more constant and regular supply, and better packing of the foreign and colonial consignments; of the lessened cost, therefore, of dealing with them, and also of the undeniable fact that, in many cases, the competition of water transit is so severe that, unless they have the rates which now prevail this traffic would equally go to its destination, and would equally compete with home produce in the market, but that the profit of carrying it would go into hands other than theirs, and so their power of spending on the development of their business would be lessened, to the general detriment of the British public.

"The Committee recognize the strength of the justification and explanation and cordially admit the generous offers and efforts made by most of the great companies to stimulate local agricultural trading, offers and efforts which have met with but very scanty recognition. The local trader cannot expect for small, irregular, and often ill-packed consignments, the same rates and facilities as are given to the larger, regular, and well-packed consignments with which he is in competition, and, in order to claim comparatively equal rates, and facilities, he must organize something like a reasonable approach to the conditions under which the competing trade is carried on."

The competition for oversea traffic between railways serving ports is not, however, singular to this country. South Africa has a history of its own in this respect. The Transvaal and Northern portion of the Orange Free State was formerly served by ox-wagon through Natal, while goods for the southern part of the Free State were transported through Cape Colony. Between 1880 and 1892 lines were extended from Capetown, Port Elizabeth, and East London, to Springfontein, and thence northwards to Pretoria, the Cape Government loaning £600,000 to the Netherlands Railway Company for the construction of the Viljoen's Drift-Johannesburg

line, and securing the right to fix the rates until December, 1894, the immediate effect of which was to divert to the Cape routes a large portion of the traffic which had previously passed through Natal. The Natal Government pushed a line forward from Ladysmith to Van Reenen on the Free State border, and to Charlestown on the Transvaal border, in 1891, which latter was extended to Johannesburg in 1895. In the meantime, however, a railway had been constructed from Delagoa Bay to the Rand in 1894, and the rates over the section from Viljoens Drift to Johannesburg were thereupon raised, with the object of diverting traffic to the Delagoa Bay route. The Johannesburg merchants then arranged to remove their goods from the Vaal River by ox-wagon, and a crisis was precipitated when President Kruger closed the drifts. The intervention of the Imperial Government caused the drifts to be reopened on 1st November, 1895. In 1907 an inquiry was made by Mr. J. Conacher as to the division of sea-borne traffic between Port Elizabeth, East London, Durban, Lourenço Marques, and the competitive area between Pretoria, Springs, Germiston, Vereeniging, and Klerksdorp, Transvaal. On 1st April, 1909, a Convention for a period of ten years was signed by the Transvaal and Portuguese Governments, part 2 of which provided that the rates should be adjusted at six-monthly intervals to produce a minimum of 50 and a maximum of 55 per cent of the sea-borne traffic referred to to the Delagoa Bay route. By an agreement between the Natal, Cape of Good Hope, and Transvaal Governments, dated 2nd February, 1909, the Natal ports were assigned 30 per cent and the Cape ports 20 per cent of the balance. The class rates on 1st January, 1923, were as follows:

RATES IN PENCE PER 100 LB. TO JOHANNESBURG KAZERNE, INCLUDING CARTAGE

	Distance. Miles.	Classes.					
		1	2	3	4	5	6
Lourenço Marques	367	123	92	71	59	47	38
Durban	486	138	101	77	64	52	39
East London ..	666	138	101	77	64	52	39
Port Elizabeth ..	713	141	104	80	67	55	42
Cape Town ..	958	193	143	107	87	73	54

Factors affecting Rate-making.—One effect of the European War was to accentuate competition between road and rail. Considerable numbers of motor vehicles built for army transport were put on the road by private firms and hauliers, and diverted a large tonnage from the railways. This form of competition differed from rail and water competition inasmuch as while the latter is confined to a restricted number of points, where opposing railways or canals meet, motor transport is available for use in any direction. Moreover, the motor haulage companies are under

no obligation to publish their rates, while the railway companies' rate books are open to public inspection. Nor are they subject to the law of undue preference. Competition between themselves and with the railway companies is the main check upon their charges for transport services, and the conditions only admit of this form of competition being met to a limited extent by exceptional rates. One feature in working, however, road and rail transport have in common, viz. the economy in balancing traffic where possible in both directions. To a large extent, particularly in the case of mineral traffic, the flow of railway traffic is in one direction, necessitating the haulage of empty wagons in the other. Approximately 30 per cent of the wagon miles travelled in Great Britain represent empty haulage, and where it is possible to find return loads even at low rates this is advantageous.

Another feature of rate-making applies to both class and exceptional rates, viz. the arrangement of group rates. This is largely adopted in the case of rates between England and Ireland, and England and Scotland. Instead of fixing rates between each pair of stations, the towns in the middle and South of England are formed into groups, similar groups being fixed in Ireland and Scotland. The rates are then arranged group with group instead of station with station. The labour of fixing rates between individual groups is reduced, and the towns within the groups are placed on an equal footing. A similar system is frequently adopted in the case of traffic to the ports, many of the coal rates having been arranged in this way.

CHAPTER V

Continental Rates

We have seen that the classification in England is divided into twenty-one classes, with minimum loads attached to each of the first eleven classes, the remaining ten being applicable to consignments of any weight, subject to the small scale when in lots not exceeding 3 cwt. The State railways of Belgium, Germany, Holland, and Switzerland, however, adopt a different model, limiting the any-quantity rates by goods train to, at the most, two classes, with a variable number of wagon-load classes, as shown in the example in the accompanying appendices. The French railways, including those of Alsace Lorraine, have a scale common to each, consisting of six series or classes for small consignments, together with a large number of scales for wagon-load traffic, to which the special tariffs or exceptional rates are applied. The companies also adopt a uniform classification.

Continental rates may roughly be said to be conveyance, or conveyance with station terminal only, for traffic in full wagon loads, but in less than truck loads to include a charge for loading and unloading. The tariffs mostly provide separate charges for loading and unloading, provision of

sheets where the rates are applicable to traffic loaded in open wagons, weighing, warehousing, craneage facilities, cartage, customs formalities, shunting charges, demurrage, siding rent, and terminal charges in connection with live-stock, including cleansing and disinfection of wagons. Bulky merchandise not weighing 200 Kgm. per cubic metre is charged on an increased weight of 50 per cent. Time periods are prescribed for the conveyance of goods according to distance and rate charged, while Article 40 of the Berne Convention, which has governed international traffic between the European states since 1890, exacts the following penalties in cases where the transit time has been exceeded and no supplementary charge has been paid for insurance.

One-tenth of the freight charges for a delay equal or inferior to one-tenth of the transit time allowed.

Two-tenths of the freight charges for a delay equal or inferior to two-tenths of the transit time allowed.

Three-tenths of the freight charges for a delay equal or inferior to three-tenths of the transit time allowed.

Four-tenths of the freight charges for a delay equal or inferior to four-tenths of the transit time allowed.

Five-tenths of the freight charges for a delay exceeding five-tenths of the transit time allowed.

The internal traffic on the Swiss lines conforms to the same rule, but

GENERAL SCALE CLASS RATES—BELGIAN STATE RAILWAY, 1923

Distance in Kilometres.	Tariff No. 2.	Incomplete loads.	Tariff No. 3						
	Fast Goods.		Slow Goods.						
	Rate per 100 Kgm.	Rate per 100 Kgm.	Rate per 1000 Kgm						
			1st Class.		2nd Class.		3rd Class.		4th Class.
			A. 5 tons.	B. 10 tons.	A. 5 tons.	B 10 tons.	A. 5 tons.	B. 10 tons.	10 tons.
	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.
10	3.00	2.10	7.56	6.30	6.48	5.40	5.76	4.80	2.75
20	3.60	2.52	11.16	9.30	9.36	7.80	7.92	6.60	4.25
30	4.20	2.94	14.76	12.30	12.24	10.20	10.08	8.40	5.50
40	4.80	3.36	18.36	15.30	15.12	12.60	12.24	10.20	6.50
50	5.40	3.78	21.96	18.30	18.00	15.00	14.40	12.00	7.50
60	6.00	4.20	25.56	21.30	20.88	17.40	16.56	13.80	8.50
70	6.60	4.62	29.16	24.30	23.76	19.80	18.72	15.60	9.50
80	7.14	5·00	32.40	27.00	25.92	21.60	20.34	16.95	10.25
90	7.62	5.34	35.28	29.40	27.36	22.80	21.42	17.85	10.75
100	8.10	5.67	38.16	31.80	28.80	24.00	22.50	18.75	11.25
150	10.50	7.35	52.56	43.80	34.20	28.50	25.20	21.00	12.50
200	12.30	8.61	63.36	52.80	37.80	31.50	27.00	22.50	13.75
250	13.50	9.45	70.56	58.80	41.40	34.50	28.80	24.00	15.00
300	14.70	10.29	77.76	64.80	45.00	37.50	30.60	25.50	16.25
350	15.90	11.13	84.96	70.80	48.60	40.50	32.40	27.00	17.50
400	17.10	11.97	92.16	76.80	52.20	43.50	34.20	28.50	20.00

NOTE.—The above rates were increased by 25 per cent from 15th April, 1924.

clause 6, Article 33 of the Belgian State Regulations limits the penalty to one-fifteenth of the freight charges per day of excess, with a minimum penalty of 1 fr. 50 c., except in the case of packages of 3 Kgm. and less, franked by means of railway stamps, and forwarded under tariff No. 2, where the indemnity is fixed at a uniform figure of 1 fr. 10 c.

Space does not permit of more than a passing reference to these features, but the following extracts from the rate books and regulations of the Belgian, French, and Swiss main railway systems may serve to illustrate the models adopted on the Continent.

EXTRACTS FROM CLASSIFICATION

Commodities.	Class.	Commodities.	Class.
Bottles (empty)	3	Iron bars	4
Bread	1	Iron ore	4
Bricks for building	4	Iron and steel (rough), in ingots, billets, or blooms ..	4
Bricks with a base of lime or cement	3	Lime	4
Cabbages	3	Manufactured goods not classified	1
Cables in iron or steel ..	2	Manures	4
Chains (iron)	2	Mineral waters	2
Cider in barrels	1	Oats, wheat, barley, rice ..	3
Clay	3	Paper for writing or printing	1
Coal, except cannel coal ..	4	Pit-wood	4
Confectionery	1	Provisions (colonial)	1
Cotton refuse	2	Timber for construction ..	3
Furniture	1		
Hay	4		

Tariff No. 2 is applied to consignments not exceeding 250 Kgm. unless otherwise consigned. Rate includes all services except collection and delivery.

MINIMUM CHARGE PER CONSIGNMENT FRANKED BY RAILWAY STAMPS

	fr. c.
Up to 3 Kgm.	1.10
Exceeding 3 but not exceeding 5 Kgm.	1.50
Exceeding 5 but not exceeding 10 Kgm.	1.80
Exceeding 10 but not exceeding 20 Kgm.	2.10
Exceeding 20 Kgm. actual rate with minimum ..	2.40
Fractions of 10 Kgm. charged as 10 Kgm. Minimum charge when not franked by railway stamps ..	1.50
Plus booking fee	0.30

Incomplete load tariff is applied to consignments exceeding 250 Kgm. unless otherwise consigned. If the rates in tariff No. 3 with a minimum of 5 tons give a lesser charge, the latter is substituted. Rate includes all services except collection and delivery. The railway company do not undertake to handle cases of glass exceeding 300 Kgm., or which cannot be loaded in covered wagons, nor consignments of eggs in full truck loads.

Tariff No. 3 is applied to truck loads according to minima and classification. Where packages classified differently make up a 5- or 10-ton lot, the rate on the highest classified commodity included in the consignment is applied to the whole.

Merchandise not classified is charged at 1st class rates.

All merchandise is conveyed in covered or sheeted wagons, except certain specified commodities, chiefly minerals.

Where the rates as in class 4 are for conveyance in open wagons, the sender can, if desired, hire sheets from the railway company to cover his traffic on payment of 6 fr., 18 fr., or 24 fr., according to whether the wagon is travelling within Belgium or to foreign countries. Senders can use their own sheets if desired, providing they bear their name and station of origin, and these are returned free on payment of a booking fee of 1 fr. 50 c. per consignment by the consignee, the advice of arrival also being charged for to the original sender.

Where the sender demands the exclusive use of a wagon, the charge is made for a truck load according to class.

Article 16 of the regulations gives a list of 147 commodities or groups of commodities which are charged as bulky goods with an augmented weight of 50 per cent.

Time Periods for Transit.—These are as follows:

Fast goods, tariff No. 2	4 days.
Incomplete loads	6 days.
Slow goods, tariff No. 3	8 days.

These exclude Sundays and holidays.

In case of delay the indemnity payable by the railway is limited to one-fifteenth part of the carriage charges per day for the excess time taken, with a minimum of 1 fr. 50 c. and a maximum of the total carriage charges. Exceptionally, consignments of 3 Kgm. and less franked with railway stamps, and forwarded under Tariff No. 2, are allowed a uniform indemnity of 1 fr. 10 c.

Liability for Loss or Damage.—Article 33 provides that in case of total or partial loss the railway company reimburses the owner with the value at the market price at the time and place of dispatch plus cost of transport. In the case of damage the company pays the amount of the depreciation.

Exceptional Rates.—Apart from the general scale, thirty-eight special tariffs are also in operation for various commodities, chief of which are metal products, manufactured or partly manufactured, and certain minerals, including iron and manganese ores, gypsum, phosphate of lime, iron pyrites, &c.

Class Rates.—The general scale of class rates for the French State Railways is given in tabular form on the following page. The rate is given for 1000 Kgm., exclusive of terminal charges, for distances from 6 Km. (minimum) to 1500 Km., for the six series.

GENERAL SCALE CLASS RATES—FRENCH RAILWAYS, 1923

Distance in Kilometres.	Rate for 1000 Kgm., exclusive of Terminal Charges.					
	Series 1.	Series 2.	Series 3	Series 4.	Series 5.	Series 6.
	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.	fr. c.
6 (minimum)	0.95	0.85	0.85	0.85	0.60	0.50
10	1.60	1.40	1.40	1.40	1.0	0.80
20	3.20	2.80	2.80	2.80	2.0	1.60
30	4.80	4.20	4.20	4.0	3.0	2.40
40	6.40	5.60	5.60	5.0	4.0	2.90
50	8.0	7.0	7.0	6.0	5.0	3.25
60	9.60	8.40	8.20	7.0	5.80	3.60
70	11.20	9.80	9.40	8.0	6.60	3.95
80	12.80	11.20	10.60	9.0	7.40	4.30
90	14.40	12.60	11.80	10.0	8.20	4.65
100	16.0	14.0	13.0	11.0	9.0	5.0
150	23.50	20.50	18.50	15.50	12.50	6.75
200	31.0	27.0	24.0	20.0	16.0	8.50
250	38.50	33.50	29.0	24.0	19.0	10.25
300	46.0	40.0	34.0	28.0	22.0	12.0
350	53.0	46.0	39.0	32.0	25.0	13.50
400	60.0	52.0	44.0	36.0	28.0	15.0
450	67.0	58.0	49.0	40.0	31.0	16.50
500	74.0	64.0	54.0	44.0	34.0	18.0
1000	129.0	109.0	89.0	70.0	52.0	31.0
1500	165.0	139.0	114.0	90.0	67.0	43.50

NOTE.—The above rates are subject to the following additions:

Series 1 to 4 .. .. 182½ per cent.
Series 5 and 6 .. .. 176¼ per cent.

EXTRACTS FROM CLASSIFICATION

Commodities.	Class.
Agricultural machines ..	2
Beer in cases	2
Beer in barrels	3
Biscuits	1
Butter (fresh)	1
Butter (salt)	3
Coal	6
Copper wire	2
Dog biscuits	1
Glucose	4
Glycerine	1
Grindstones	5
Hardware, not otherwise classified	1
Limestone	6
Iron wire, galvanized or otherwise	3
Malt	4
Milk (sterilized)	1
Potatoes	4
Rum in barrels	3
Sand	6
Stone for macadam	6
Sugar (raw)	4
Tubes (iron or steel)	3
Wheat, barley, oats	4
Wine in bottles	2
Wine in barrels	3

Terminal Charges.—

	fr. c.
Booking fee per consignment (obligatory)	0.15
Loading per ton	0.60
Unloading per ton	0.60
Station terminal at sending point (obligatory)	0.55
Station terminal at receiving point (obligatory)	0.55
Total	2.30

Where merchandise is forwarded in 4-ton lots and upwards the terminal charges are as follows:

	fr. c.
Booking fee (obligatory)	0.15
Loading per ton	0.45
Unloading per ton	0.45
Station terminal at sending point (obligatory)	0.30
Station terminal at receiving point (obligatory)	0.30
Total	1.50

NOTE.—The terminal charges are subject to similar additions as in the case of the conveyance rates. Cartage is performed by the railway companies at the principal stations at varying rates according to distance and locality, and these are added to the conveyance and terminal charges.

The following are the principal regulations applying to traffic charged at the class rates 1 to 6.

Article 3.—Commodities of all descriptions, except dangerous goods, are allowed a reduction of 10 per cent on the conveyance rates (terminals not included) when exported by land or sea.

Article 5.—Consignments of 40 Kgm. or less are charged 25 c. per ton per kilometre irrespective of class, the charge not to exceed that for a consignment weighing 40 Kgm.

Article 7.—The minimum charge for conveyance, including terminals (except cartage), is 60 c. per consignment, a fraction of 10 Kgm. being charged as 10 Kgm.

Article 14.—A transmission charge of 30 c. per ton is allowed to each of the companies on goods passing over two or more systems. This charge does not apply to consignments of 40 Kgm. or less, nor where through rates exist, nor to traffic passing from the railway to a private siding. The junction charge is, however, increased to 45 c. per ton on traffic passing from a normal to a narrow gauge line.

Where traffic is loaded or unloaded by the railway company the charge includes the use of the crane or other appliances, but where the sender or consignee uses the company's hand crane a charge of 25 c. per ton and per operation is made, with a minimum of 40 c. per half-hour.

Article 36.—Where the trader loads or unloads wagons this must be effected in one day, provided they have been advised to him before 7 p.m. the previous day, and are in position at the opening of the station the following morning. If this time be exceeded, the following demurrage charges are made.

	16th Sept. to 15th Dec. fr.		16th Dec. to 15th Sept. fr.
For the first 24 hr.	15	....	12
For the second 24 hr.	18	....	15
For the third 24 hr.	20	....	15
For each additional period of 24 hr.	25	....	18

Article 38.—The same rules apply to privately owned wagons, except that the charges are as follows:

	fr. c.
For the first 24 hr.	7.50
For the second 24 hr.	7.50
For the third 24 hr.	7.50
For each additional period of 24 hr. ..	9.0

Article 51.—The time periods for conveyance are as follows (A), with an exception in the case of certain main routes prescribed by the ministerial decree, e.g. Paris to Calais, Paris to Bordeaux, Rouen to Amiens, Bordeaux to Cette via Toulouse, Paris to Marseille, &c. (B):

Distances in Kilometres.	A. Days.	Distances in Kilometres.	B. Days.
From 1 to 150 inclusive	2	From 1 to 200 inclusive	2
„ 151 to 275 „	3	„ 201 to 400 „	3
„ 276 to 400 „	4	„ 401 to 600 „	4
„ 401 to 525 „	5	„ 601 to 800 „	5
„ 526 to 650 „	6		

The above periods are exclusive of the day of acceptance and delivery by the railway company. The time period is extended a further 24 hours in the case of traffic from stations in Alsace Lorraine to stations on the old French main systems.

Exceptional Rates.—For internal traffic in France the exceptional rates or special tariffs with quantity conditions are grouped as follows, excluding No. 1, which applies to animals:

No. 2. Grain, flour, seeds, vegetables (dry), food pastes, potatoes.
No. 3. Provisions, fruits, vegetables (green), dairy produce.
No. 4. Rock salt, sea salt.
No. 5. Beetroot, sugar, molasses, dextrine, and glucose.
No. 6. Beverages (including beer, wine, cider, mineral waters, and vinegar)
No. 7. Fuel (coal, &c.).
No. 8. Charcoal and firewood.
No. 9. Timber for construction, and pit timber.
No. 10. Lime, cement, and plaster.
No. 11. Building materials.
No. 12. Stone and earth used in arts and industries.
No. 13. Minerals.
No. 14. Metal products.
No. 15. Resin, pitch, mineral oils, and combustible liquids.
No. 16. Fats and their derivatives.
No. 17. Dyeing materials.
No. 18. Chemical products.
No. 19. Paper, cardboard, and materials for manufacturing them.
No. 20. Tissues and textiles (cotton raw, linen, woollens, &c.).
No. 21. Pottery and glassware.
No. 22. Manures and fertilizers.
No. 23. Trees and shrubs, hay and straw.
No. 24. Furniture and manufactured objects.

No. 25. Empty packages (new).
No. 26. Returned empties.
No. 27. Animal refuse and accessory products.
No. 28. Contractors' materials for railway and tramways, show vans, &c.
No. 29. Consignments of abnormal dimensions, goods in owners' wagons, exhibits for agricultural shows, exhibitions, &c.

Many of these are subdivided, viz. traffic local to one railway, goods passing over two or more railways, and export traffic. The exceptional rates to which these are applied as distinguished from the class rates are set out in tables numbered 11 to 27, R1 to R11, A to N, and R.A. to R.G. Certain of the groups, however, have separate tables for some of the commodities embraced within each group.

GENERAL SCALE CLASS RATES—SWISS FEDERAL RAILWAYS, 1923

RATES PER 100 KGM. IN CENTIMES BY SLOW GOODS SERVICE

Distance in Kilometres.	Incomplete Loads.		Wagon Loads.							
			General Classes.		Special Tariff.					
					I.		II.		III.	
	1	2	A. 5 Tons.	B. 10 Tons.	A. 5 Tons.	B. 10 Tons.	A. 5 Tons.	B. 10 Tons	A. 5 Tons.	B 10 Tons.
10	76	71	51	47	40	34	38	32	33	26
20	122	112	86	77	67	56	64	51	54	40
30	168	153	121	108	95	78	90	70	75	54
40	214	194	162	144	126	104	120	93	99	72
50	260	235	205	183	158	130	150	116	124	89
60	306	276	240	213	185	152	176	136	145	103
70	352	317	275	244	213	174	202	155	165	117
80	398	358	310	274	240	196	228	174	186	131
90	444	399	345	305	268	218	254	193	207	145
100	490	440	380	335	295	240	280	212	227	158
150	663	593	510	448	398	322	378	284	305	210
200	835	745	640	560	500	404	475	356	382	261
250	938	835	716	626	560	452	532	398	427	291
300	1040	925	792	692	620	500	589	440	472	321
350	1133	1005	862	753	675	544	641	479	514	349
400	1225	1085	932	813	730	588	693	517	555	376

In arriving at the charges per consignment fractions of 10 Kgm. are charged as 10 Kgm. When the amount obtained is not a figure divisible by 10 without result, it is rounded off to a superior figure divisible by 10 if the result is at least 1 centime.

Articles 2 and 8. General Traffic Rules.

Minimum Conveyance Charges.—Minimum weight per consignment petite vitesse 20 Kgm., with a minimum charge of 60 c.

Incomplete loads.—Class 1 is applied to less lots than 5 tons of commodities not included in the classification for special tariffs I, II, and III. Class 2 is applied to consignments under 5 tons of traffic classified in the special tariffs I, II, and III.

Wagon loads (*general classes*).—These rates are applied to consignments of A, 5 tons; B, 10 tons, not specially classified.

Terminal Charges.—The following are examples of the terminal charges made by the Swiss railways in addition to the conveyance rates:

Article 52. Consignment notes.

When consignment note forms are supplied by railway company:

For interior traffic, per copy	2 c.
For international traffic, per copy in duplicate	3 c.

Article 53.

For stamping and certifying consignment note forms not supplied by the railway company:

For interior traffic, for 100 forms	15 c.
For international traffic, per 100 forms in duplicate	25 c.

Article 54.

For receipts furnished by the railway company, each	1 c.

Article 8. Loading and unloading.

The railway companies do not accept any obligation to load or unload traffic at rates excluding these services, but when they do perform them at the request of the trader the charges are:

Article 9.

(*a*) For merchandise of all kinds not exceeding 250 Kgm. per package, per 100 Kgm.	5 c.
(*b*) For packages exceeding 250 Kgm., per 100 Kgm.	7 c.

Article 10.

For packages loaded or unloaded by means of a crane, per 100 Kgm.	5 c.

Article 11.

Where the loading or unloading occupies an undue length of time owing to special difficulties, a charge per workman and per hour is made of	1 fr. 20 c.

Article 12.

Where consent is given to sender or consignee's employees manipulating the crane under the supervision of a railway official, the charge per 100 Kgm. is	4 c.

Article 47. Sheet hire.

Traffic carried under special tariffs I, II, and III (excluding 202 specified commodities which can be conveyed in covered trucks), and articles in other classes which cannot be loaded through the van doors, and by reason of size or length are conveyed in open wagons. The trader can hire sheets to cover such traffic at the following rates:

For a single sheet, per 100 Km. or part thereof	2 fr.
For each additional sheet, per 100 Km. or part thereof	1 fr.

Article 50. Hire of ropes and chains

When the railway company furnishes ropes and chains at sender's request to secure consignments loaded by him for transit by railway, the following additional charges are made:

Wagons labelled to stations in Switzerland, per rope or chain ..	75 c.
Wagons labelled to stations on foreign lines, per rope or chain ..	1 fr. 50 c.

Articles 34 and 35. Charges per wagon per day for detention of wagons, where the rates provide that sender loads or consignee unloads the traffic.

1. For empty wagons furnished at sender's request and not loaded within 24 hr. after delivery	5 fr.
2. For loaded wagons not discharged within 48 hr. after advice to consignees. Where five or more wagons arrive together for the same consignee the first four must be unloaded in 24 hr., and the remainder in 48 hr.	5 fr.
3. For loaded wagons received and partly unloaded, reloaded, and not reconsigned within 24 hr.	5 fr.
4. For loaded wagons arriving and being reloaded after discharge a free period of 48 hr. is allowed. If five or more wagons are received loaded at one time and are reloaded, the first four must be completed within 48 hr., and the remainder in 72 hr.	5 fr.
5. For wagons delivered to private sidings the detention period is 10 hr. from the time of delivery	3 fr.

Article 48. Charges for detention of sheets hired from the railway company.

The free periods for sheets correspond with those for wagons, the detention charges in excess being:

For the first, second, and third period of 24 hr.	1 fr.
For each additional 24 hr.	2 fr.

Article 50. Detention of ropes and chains.

The free periods for binding material correspond with those for wagons, the detention charges in excess being:

For the first, second, and third of 24 hr.	50 c.
For each additional 24 hr.	1 fr.

Article 61. Advice of arrival of merchandise.

The cost of postage, telephone, or telegraph fee is charged to the consignee. If the railway company agrees to deliver the advice by special messenger, for each journey and each distance of 2 Km. .. .. 30 c.

Article 62. Collection and delivery of merchandise.

When carted by the railway administration a separate charge is made, varying according to distance and locality.

Articles 13 and 14 of the Annexe to the terminal charges Regulation.

This article provides separate charges for packing, &c., material loaned to senders, and for detention charges by consignee when not released within the free period.

Article 26 of the Annexe.

Where the railway company undertakes, at the trader's request or convenience, to move wagons from one position to another, a charge of 12 fr. per engine hour and 1 fr. 20 c. per man hour is made for the service, with fractions of 5 min. per engine and 15 min. per man charged as 5 min. or 15 min. respectively. Minimum per operation .. .. 2 fr.

Article 24 of the Annexe. Temporary closing of wagons by the railway staff.

When at the request of the sender or consignee railway wagons are closed by means of padlocks owing to cessation of loading or unloading by the railway employees during the hours of midday or during the night, a charge is made per wagon of .. 30 c

EXTRACTS FROM THE CLASSIFICATION

Commodities.	Class.
Caustic soda	I
Cereals of all kinds	III
Coal	III
Coke of all kinds, including briquettes	III
Cotton (raw)	I
Cucumbers, gherkins, onions, and garlic	II
Iron, steel, chains, cables, keys, barrels, washing-machines, &c.	I
Iron, steel bars, angles, sheets, &c.	II
Iron and steel billets, scrap iron and ingots, &c.	III
Lime and cement	III
Manures	III
Paper for packing	I
Products of fields and gardens (potatoes, carrots, beet-root, cabbages, &c.	III
Other products of fields and gardens	I
Silicate of soda	I
Sugar	I
Tar macadam	III
Wool	I

Exceptional Rates.—The exceptional rates are divided into groups much in the same way as the exceptional rates in France, the commodities for which such rates are provided being as follows:

Tariff Number.	Commodities.
1	Beer in casks.
2	Living plants.
3	Provisions.
4	Bread, fresh butter, &c.
6	Cereals.
7	Wine.
8	Ice.
9	Agricultural products.
11	Hay and straw.
13	Cement, lime, and gypsum.

Tariff Numbers.	Commodities.
14	Manures.
17	Wood pulp, &c.
18	Peat.
19	Stone, gravel, and sand.
20	Coal and briquettes.
21	Salt.
22	Anthracite.
23	Linoleum of Swiss manufacture.
31	Carbide of calcium.
33	Ferro-metallic alloys of Swiss manufacture
34	Paper of all kinds.
35	Wood pulp of Swiss origin.
36	Metal products.
42	Beetroot to Aarberg.
43	Insecticides, &c.

THE WORKING OF THE GOODS DEPARTMENT

BY

HENRY W. EDE

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The Working of the Goods Department

CHAPTER I

Cartage and Reception of Goods

To deal with the working and administration of the goods department of a British railway in much detail would require a whole volume to be devoted to the subject. In the following pages, therefore, only a brief survey of the matter is possible, in which the principles underlying the working, also the main details, are covered. Minor details can best be added by those who need to do so, and in accordance with their local circumstances. Perhaps the best way to deal with the matter will be to divide it into ten main divisions:

(*a*) The collection, delivery, and handling of the goods.
(*b*) Provision of wagons.
(*c*) Conveyance.
(*d*) Clerical work in connection with the foregoing at stations and in head and district offices.
(*e*) Train working.
(*f*) Shunting.
(*g*) Accountancy and collection of charges.
(*h*) Statistics.
(*i*) Correspondence.
(*k*) Claims.

Although a railway company is under no statutory obligation to perform the services of collection and delivery, yet it is undoubtedly to the public convenience that such services are performed by the railways on the traders' behalf. This service under existing General Railway Classification is charged for by the companies at agreed figures, included in the C. and D. (collected and delivered) rate, or by an additional charge over and above the S. to S. (station to station) rate, either by manner of an all-round charge or a series of charges based upon the extent and nature of the cartage in-

volved. The Railways Act, 1921, stipulates that on and after the "appointed day" the charges for "collection and delivery" shall be shown separately from those in respect of the rail portion of the journey, and probably one cannot do better than quote the section of the Act, which reads as follows:

"On and after the appointed day a railway company may collect and deliver by road any merchandise which is to be or has been carried by railway and may make reasonable charges therefor in addition to the charges for carriage by railway, and shall publish in the rate book kept at the station where it undertakes the services of collection and delivery the charges in force for the collection and delivery of merchandise ordinarily collected and delivered."

Traders are not prevented under this arrangement from performing their own cartage work; and if they elect so to do, every facility is afforded them.

Organization of Cartage Department.—Some companies prefer to perform the cartage services by their own staff and equipment; others contract with a master carter to act on their behalf, or appoint cartage agents, or adopt all three methods. During the past few years practically all railway companies have introduced mechanical transport for the collection and delivery of merchandise, and whilst the motor has superseded the horse as a means of traction on roads, the railway horse and dray is still familiar, and collection and delivery by motor lorries comparatively rare. It would, perhaps, be well to consider here why mechanical traction has not superseded the horse for this particular phase of railway work. There are many reasons. In the first place, as a rule, the cartage boundary is within a radius of about 2 miles, and the collection or delivery of a dray-load of "C. and D." traffic may mean many stops, often of considerable duration, within that area, and as much of the journey is made in busy thoroughfares, the advantage of speed which the motor normally has over the horse is nullified. Where, however, full loads are obtainable for one point of collection or delivery, and a long run necessary, the advantage undoubtedly lies with the motor, but whether such form of traction is more economical than horse cartage very largely depends on the local circumstances.

The cartage department proper needs careful organization and continual revision, so that the very best service can be maintained to keep pace with the changes of business that must inevitably occur in towns and districts from time to time. The chief foreman should be capable of controlling men, and possessed of a good knowledge of the districts to be covered by his vans and the amount and nature of the work involved. In the larger centres it is advisable to appoint inspectors to travel about, keeping in touch with both the traders and the carmen, to advise the chief foreman, and to supervise special or unusual cartage operations.

A town should be mapped out into districts, a carman being allotted to each district, and, as far as practicable, regularly employed therein. This enables the carman to attain the maximum results in his work, as he can become well acquainted with the ground to be covered, and fully understand the individual requirements of the various traders. For the delivery

and collection of miscellaneous goods it may be necessary that a " lorry boy " or " van guard " should travel with the carman, so as to protect the goods and to keep watch over the horse and van during the time the carman is engaged in delivering goods, &c.

The carman should be educated up to the necessity of noting the condition of the goods handed to him, and of giving qualified signatures when such goods are frail or damaged. He must also be trained to know what kind of consignment note he may accept for the traffic accepted for conveyance, such as the " owner's risk " note, &c. Incidentally, he should also be a valuable asset as a canvasser for traffic, as he will have many opportunities in this direction.

There is no better way to obtain good work from a carman than to supplement personal training by the issue of a book of convenient size containing all that he should know to be able to carry out his duties successfully. A carman should always carry a sufficient supply of consignment notes, so that the contract between the sender of goods and the carrying company may be correctly made out on an authorized form. The consignment note must bear the " general conditions " under which goods are carried; and it is also very convenient, both for traders and the companies, to supply the larger trading houses with consignment notes either loose or in book form. A convenient form of consignment note is shown in fig. 1, p. 202.

On arrival at the station a van should be weighed on the weighbridge, and an entry made of the gross and net weight of each load. Whilst the weighing is going on, the consignment notes should be progressively numbered, and this can best and most readily be done by the employment of an automatic numbering stamp.

It is necessary that the goods agent or direct controlling authority should be in possession of information daily showing the time occupied by each carman for each journey he makes, together with the weight carted, and for that purpose a record in somewhat similar form to that given in fig. 2 should be kept. This form answers several purposes: it is a means of check upon the carmen, and enables the agent to see whether the stock of horses and rulleys is sufficient to meet traffic requirements. In addition it forms the basis of any regular information which has to be supplied to head and district officers of the cartage results at the stations generally. In the latter connection the cartage superintendent or analogous administrative officer should receive regular information from all the principal stations showing the number of horses working, tonnage carted, and the cost, to enable him to compare month by month the cost per ton.

When the carman has set his van against the unloading deck, he loosens his horses. Even if there is no room at which he can set the van, there is usually no need to detain a carman whilst his load is waiting to be set in place at stations where the business is sufficiently large to warrant the employment of a " vansetter ". This employee is provided with a loose horse, and it is his duty to take over a van as soon as a carman has

CONSIGNMENT NOTE

Pro No.

... ... .RAILWAY. ... ... STATION, . . 19

The ... .Railway Company are requested to receive and forward, as per address and particulars on this note, the under-mentioned goods, on the conditions stated on the other side.

Signature of Sender or his representative .... *Address* . *Witness* . .

Consignee.	Address.	No. of Articles.	Description of Goods and Marks.	Weight.	Rate.	Paid On.	Paid.	To Pay.	Who Pays Carriage.

Fig 1 —Specimen Consignment Note

Date.	Name of Rulleyman.	District.	Time from and to Stables.		Rulley Number.	Journey Outward or Inward.	Time Out or In.		Total Time Out.		WEIGHT.												Carted by each Rulleyman per Day			Remarks.
			From.	To.							Gross.			Tare.			Net.									
																	In.			Out.						
							Hr.	Min	Hr.	Min.	Tons.	Cwt.	Qr.	Tons	Cwt.	Qr.	Tons.	Cwt	Qr.	Tons.	Cwt.	Qr.	Tons	Cwt.	Qr.	
						Outward																				
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Fig. 2.—Rulley Time and Weigh Book

[Facing p. 202, Vol. I.

unhitched his horses and to set the van against the unloading deck at the earliest moment. At the smaller stations the carmen should assist in discharging their loads, and remove the van when this is done.

The consignment notes must be scrutinized to see whether a load contains goods for early services or not, so as to prevent any such consignments being overlooked and delayed.

Where accommodation permits, the best method of unloading is for the vans or lorries to be set against the deck " end-on ", that is, with the tail-board flush with the edge of the deck. This method of setting the vehicles is immeasurably superior to setting them sideways, as usually it means that five vehicles can be set end-on as compared with two sideways, and there are five possibilities of quickly unloading the early-service goods as against two. Not only so, but the whole process of unloading can be facilitated.

Multiple-entry Consignment Notes.—It is by no means uncommon to receive consignment notes containing two or more entries of goods for dispatch to two or more places. This practice of making more than one entry on a consignment note may be, and doubtless is, of some convenience and economy to a trader, but the convenience and economy gained by a trader is by no means equivalent to the inconvenience and expense to which the railway company is put. The companies have to fight against time, and to do so successfully the routine of working has to be simplified as much as is possible. The multiplication of entries on a consignment note is a distinct bar to simplicity, and its evils should be repeatedly urged upon the notice of traders so as to induce them to cease the practice. Where traders urge that single-entry notes are impracticable, an excellent compromise can be made by the supply of perforated interleaved consignment notebooks or pads. These are best made up in fours or eights—the " general conditions " and the space for consignor's signature being on the top perforated portion—one entry to be made on each perforated portion. The trader fills in the details, making a carbon copy on the interleaved page. The copies are retained, and form the traders' dispatch and receipt book; the notes are split up at the station, and all extracting is avoided. This system lends itself to further developments in the accountant's department, as will be shown in the chapter on " Accountancy ".

Extracting.—Until the single-entry note becomes universal it will be necessary to continue the process known as " extracting ". As soon as possible after the arrival of a load of goods the consignment notes are passed to the " extractor ", whose duty it is to transcribe the entries from notes containing two or more entries for goods to different stations to " extract " notes, one entry or destination to each note. This is necessary, first, to enable the notes to follow the goods, and, secondly, to assist the work of invoicing.

Composition of Gangs.—The strength of the gang employed to unload the goods must depend entirely upon the local conditions; but at all large stations a " checker " and a " caller-off " are necessary, apart from

the porters or truckers. The number of porters or truckers depends upon whether the " lay-out " of the goods shed involves short-distance or lengthy trucking, clear trucking space, &c.

Checker's Duties.—The responsible man of the gang is, of course, the unloading checker. His duties are to accept the traffic from the carmen and compare the goods with the consignment notes, correcting all errors and completing the notes by inserting all information which may have been omitted at the time it was written out. He has to superintend the weighing of the articles and insert the weight of each consignment in plain figures on the consignment note as they are unloaded from the van or lorry, supervise the caller-off, and see that he correctly calls out the details of the label; also he must see to the labelling of any packages that are unaddressed, or consigned under-mark, and must satisfy himself that the traffic tallies with the descriptions given on the consignment notes.

Should any articles be unloaded for which he is not in possession of a consignment note, the checker must make out an " unentered " note, giving all possible details. To keep the number of such cases down to a minimum, it is necessary to deal with the carmen who bring goods in without consignment notes. In addition, the checker must tell the truckers to which loading berths the goods are to be trucked, and to do this efficiently he must be educated in the loading arrangements and the times for the departure of the various trains. Further, he must see that the sender's instructions as to payment of carriage agree on the label and the consignment note. A great number of " open " notes, i.e. notes from which senders have omitted carriage charges, accompany goods labelled " carriage paid ", and a good deal of trouble ensues if the unloading checker fails to record the label instructions on the note. A good plan to ensure the performance of this duty is to instruct the checker to show " C.N.S." (i.e. carriage not shown) on open notes when neither note nor label bears carriage instructions. This arrangement is also very useful in the case of goods received without note, when, in addition, it may be necessary, should sender's name not be shown on the label, to add " N.S.S." (i.e. no sender shown).

Other duties of the checker include the noting of the condition of the goods on receipt, and seeing that, where possible, small repairs are done to damaged articles so as to render them fit for travel. The proverb that " A stitch in time saves nine " is by no means to be neglected in railway life; a damaged article neglected is a claim invited.

Traffic requiring to be dispatched by the earlier services demands special attention, and this can best be done by regulating the loading of the drays so that the " early " traffic can be picked out and unloaded without delay.

Economy of trucking can be obtained by arranging that the drays shall be backed up or " set " at the point nearest to the wagon-loading berth for the station or stations to which the greater proportion of the traffic on a load may be consigned. Obviously a dray containing traffic

one-third of which is for loading in a specific " run " or " dock " is most economically dealt with when it is set at the point nearest to that run or dock. It is also advantageous to reset a dray, which has been partly unloaded, at another point against the deck, with the same object. A dray containing goods for only one destination is best set right away against a wagon, and the contents transferred thereto direct.

The introduction of the small electric trucks (fig. 3) for the conveyance of traffic from dray to wagon, and vice versa, has greatly facilitated the speed at which traffic can be dealt with, as under the old system one man takes a barrow-load, whilst with the electric trucks it is possible, if the lay-

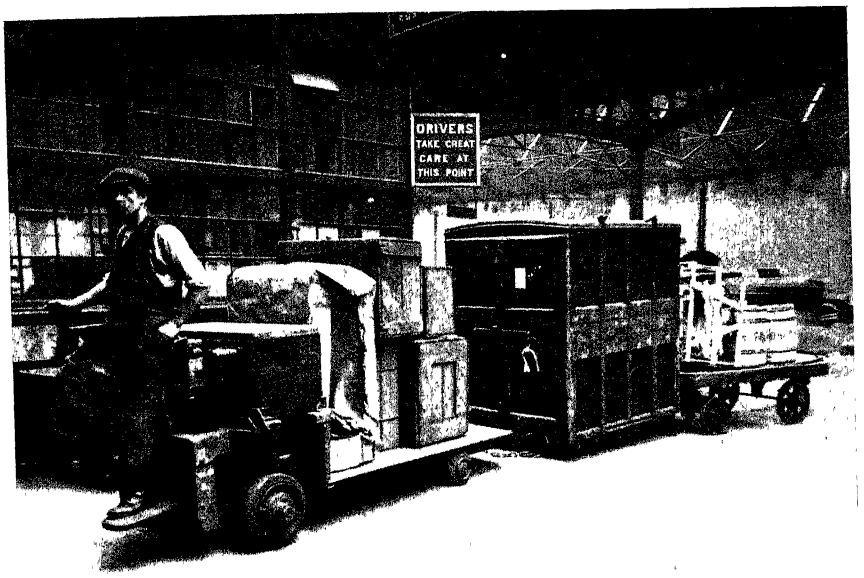

Fig. 3.—Electric Truck in Operation

out of the stages permits, to also attach two or three trailers, and it is claimed at one of the largest goods stations where these electric trucks have been installed that one of them will do the work of six hand-barrows.

Labelling.—The labelling of the unaddressed and under-mark goods is of great importance, and, where time permits, every such article should be labelled immediately it is unloaded from the van or dray. It is not practicable, on account of the short time at the disposal of the companies, to label every package with full details; and the best method, therefore, is to label one package in each consignment with full details, and the remaining packages with the names of sending and destination stations only. The labels should be of two kinds—adhesive and tie-on, the tie-on label being fitted with thin wire thread; the name of sending station should be printed or stamped on each label.

A good plan is to have the labels written up by the " extracting " staff immediately on receipt of the consignment notes, an arrangement which

facilitates the use of the subsidiary or " destination " labels, as it enables one label rack to serve the purposes of an entire station, whereas if the unloading checkers or receivers have to store the labels on their desks, many racks are necessary.

The processes already described refer equally to miscellaneous traffic carted in by the traders' own teams, except that such teams cannot well be moved about a station to suit the convenience of the railway company. The attention necessary for public teams will be dealt with in Chapter III.

CHAPTER II

Provision of Wagons; The Loading of Goods into Wagons

Suitable wagons must be provided for the conveyance of the traffic, and it is essential that some idea be forthcoming of the probable wagon requirements.

A station may not have on hand sufficient empty wagons to cope with the probable traffic to be conveyed, i.e. it is an excess forwarding station. The problem of wagon supply is an involved one and needs a systematic control, so that superfluous wagons at one point can be expeditiously and economically worked to the point where they can obtain loads. The aim is to work the traffic with the minimum of stock, which brings in its train economies in capital cost and maintenance, saving in empty wagon haulage, and minimum storage lines.

The position must be reviewed over a wide area, often the whole system; but subdivisions will be found necessary, and daily information must be supplied by stations and depots to show the number of wagons required, the number available for loading, the number under load which will probably be available, and the number of additional wagons required. In certain cases a station at which the traffic received is in excess of that forwarded will have wagons to spare.

The common-user arrangement of goods wagons, which was introduced during the period of Government control of railways, has had an important bearing upon the method of supply of wagons. Prior to its institution, " foreign " companies' wagons were sent " home empty " unless there was a load available for, or in the direction of, the parent line. Under the common-user system, however, the ordinary types of wagons, irrespective of railway ownership, are loaded to any station or, if no loads are available at point of unloading, they are sent to those stations requiring wagons for loading. The arrangement is undoubtedly conducive to economical working, as it has obviated the haulage of the empty or only partially laden wagons back to the owning companies' lines.

The first essential for the loading of goods is the provision of sufficient berthing accommodation. Local circumstances will not always permit the attainment of the ideal, which is one berth per loading point per day, but this should never be neglected where it is possible to attain to it.

Ample berthing accommodation means a greater accuracy in working, because there is practically no danger of goods being deposited at the wrong berth without early detection of the error. It also means economy in working, as the goods can be run more readily, if desired, straight into the trucks, so avoiding the stacking and congestion of goods on the stages. The amount of stacking of goods on the stages is in direct relation to the provision of berthing accommodation. The fuller the accommodation the less the amount of stacking, and vice versa. Further, the stacking of goods on stages, in addition to increasing the chances of congestion, adds considerably to the amount of handling necessary to deal with the traffic. Not only does this increase the cost per ton of traffic dealt with over the stages, but it also increases the risk of damage to the goods and consequent claims.

It is essential that each loading berth should have shown over it, by means of a board fixed to the wall, or suspended from the roof, the name of the station or the stations to which goods are loaded at each post.

The accommodation available for loading goods into wagons has a direct bearing on the number of checking operations in connection with the forwarding of the traffic. Where there is one berth for each destination to which loads are regularly made, there does not exist the same necessity for a checker at the wagon side as well as at the dray side, as there does where goods for several destinations are stacked at one berth. If the dray-side checker (unloading the goods) is sufficiently competent, he can direct the truckers as to the trucking and loading of the traffic; and with every article properly labelled the loader at the truck side can regulate the loading wagons, and has no need to scrutinize and check the consignment notes. Of course, where several wagons are being loaded to one place at a time, it is necessary to show on the consignment notes the number of the wagon in which the goods are loaded, so that the entries may be correctly made on the invoices, and the entries on any one invoice, or set of invoices, exclusively correspond with the goods loaded in one wagon. This may be done by the truckers reporting to the checker the number of the wagon to which they have trucked the goods, or by the checker comparing the goods and the consignment note at time of loading.

Usually a loading checker may be expected to control the loading of ten or twelve wagons at a time, with the assistance of two men. When there is no check to consignment notes at the truck side, two men should be sufficient to cope with the loading of the wagons.

Varieties of Loads.—There are five kinds of loads to be considered in the handling of miscellaneous goods traffic, namely, the direct or full load, the mixed load, the tranship load, the road van, and the " make-up ".

Taking these different possibilities in the order given, the first is the

direct or full load. This is a load made up entirely of goods for delivery at one destination, and is the simplest load that can be made, as, assuming that all the goods are properly addressed or labelled, the work is so straightforward that it cannot admit of excuse for errors or irregularities.

The mixed load is that made up of goods intended for delivery at the destination station, together with goods intended for transhipment at that station, and is to be avoided as much as possible. Confusion is only too easily caused when dealing with a mixed load if anything goes wrong with the invoices or labels. When more than one wagon is being loaded to one point at the same time, it is distinctly advantageous to correct working to keep all the goods for transhipment apart from goods for delivery at the station to which the wagons are loaded, by loading the transhipment goods in a separate wagon. This is not always practicable, but, where it is, is strongly recommended. If it is not possible, then the transhipment goods should be loaded at one end of the wagon, and the delivery goods at the other.

Transhipment.—The tranship load has for its main object the avoidance of unnecessary haulage of rolling stock, and is an absolutely necessary factor in the work of transport; the tendency to smaller consignments promises an increasing amount of transhipment. It is important, however, to see that transhipping is not needlessly indulged in, and the position of affairs needs to be reviewed from time to time, as the handling of traffic is a heavy item of expenditure, and especially so in respect of that conveyed short distances, where, if transhipments were at all frequent, the cost of the labour entailed would soon make the traffic unremunerative. There is also considerably more delay in the transit time when merchandise has to be transhipped, and this factor is a very important one nowadays in view of the keen competition by road motor transport with which railway companies are confronted.

One method of ascertaining the transit time of small consignments is by the periodical use of a " Journey Time Slip ". This is a tally affixed to consignments giving the originating and destination stations, weight of consignment, date and time of forwarding, receipt and delivery, number of transhipments *en route*, distance conveyed, &c. The forwarding station staff fill in the columns regarding dispatch, the transhipping and reception particulars being filled in by the receiving station staff. The completed slip constitutes a full record of the journey of the consignment from its receipt by the railway company to its delivery to consignee.

Whilst a certain amount of transhipping is inevitable, an analysis of the " Journey Time Slips " will reveal those cases where the journey time and transhipments are excessive in relation to the distance conveyed, and where incorrect loading has taken place. It will also afford useful information for the improvement of through-wagon services and tend to reduce delay and transhipment to the minimum.

The factors to be borne in mind, in arriving at a scientific result as to how much weight for one place shall be sent to a second place for tran-

shipment, are the cost of transhipment, cost of wagon haulage, value of rolling stock, and transit value representing the depreciation of the value of the goods by reason of possible later delivery. If the second and third factors minus the last equal the first factor, one may safely tranship; if they outweigh it, load direct.

The essential of a tranship load is not that it shall contain goods for a variety of destinations, but that it shall contain goods for a variety of destinations which can conveniently be served from a given centre, which centre should be the point to which the goods are loaded.

Having arrived at a result, it is necessary to convert it into a convenient and practical unit, and to arrange that the minimum weight for a full load shall be, say, 1 ton, 1 ton 10 cwt., or 2 tons, as is most economical, and that traffic under the minimum decided upon shall be loaded for transfer.

The tranship stations should be set up in convenient centres of each division of the line, and thus reduce to a minimum the light loading of wagons both to the tranship station and from the latter point to destination. The more conveniently placed a tranship station is, the less the possibility of light loads to stations served thereby.

To revert momentarily to the varieties of loads, it should be said that the " make-up " is a kind of cross between a tranship and a direct load. A station may have a fair quantity of traffic for one destination, which, though insufficient to warrant a through load being made, is yet too much to load for transhipment, if such a course can be avoided by loading to another station in the same district, for that station to add its quota of traffic for the same destination. This combination of traffic should frequently prevent two loads of goods being hauled to one station by enabling a direct load to be made instead, thus avoiding both undue handling of goods and haulage of rolling stock.

Tranship Centres.—The more highly organized a railway is, the more perfect will be its arrangements for transhipment and the interception of goods and wagons, so as to prevent unnecessary haulage of rolling stock.

It is not often convenient to set apart a shed wholly for transhipment of goods, and it does not follow that it is always economical to do so. In a large town, where there is a good steady flow of " home " traffic, it is obviously advantageous to the loading to be able to supplement the home traffic by " tranship " traffic, but in a country district the home traffic may be almost a negligible quantity.

Convenient centres should be selected to serve as tranship points, and the traffic in small lots for the stations in the area served by any such centre should be concentrated at it. The work of transhipment is not very different from that of handling ordinary traffic, and the following sets out the method of dealing with transhipments at Crewe, one of the largest tranship stations in the country. On arrival at the station the invoices are collected and taken to the sorting office. This office is fitted with a great number of pegs, each of which is surmounted by a number. The number of pegs corresponds to the number of loading berths, and the numbers over

the pegs correspond to the numbers over the loading berths, each berth having its own number.

The invoices are marked with the number of the berth to which the goods are to be trucked for loading, and are then sent out to the unloading checker, to whom the numbers serve as a guide in the disposition of the traffic. As soon as the goods entered on an invoice have been unloaded, the invoice is returned to the sorting office and hung on the peg corresponding to the loading berth to which the goods have been sent, there to await the convenience of the loading checkers, who can at any time obtain from the pegs the invoices for the goods at their berths. The numbers are also chalked on the goods by the unloading checkers, so that there cannot be any doubt as to which loading berth an article is to be taken.

A point of importance is the insertion of the transhipping details on the invoices. In this, practice differs, some companies stamping the documents, and having the details inserted within the stamped impression; other companies—and this is much the better way of the two—make special printed provision for information at the top of the invoice, so that it is quite impossible, except from wilful carelessness, to insert the remarks in such a way as to obliterate any of the invoice details. This latter method has now been standardized by the railway companies. Some companies have adopted a distinctively coloured invoice for use at transhipping stations, and on this are entered goods received without invoice. This is much to be recommended. (See fig. 4.)

Road Vans.—Returning to the making up of trains, reference must be made to road vans, which are an important feature of the working. A road van is a wagon or van to be loaded with goods for several destinations which are comprised within the compass of a section of the main line or a part or whole of a branch line, and to the stations of which section or branch there is not usually a sufficient volume of traffic at the starting-point of the road van to enable through loads to be made to any one of the stations so served. A road van is attached to a stopping train in order that at each station the goods for such station may be removed from the van, and that other goods on hand at the station destined for another station farther on, served by the van, may be put into it.

It will be obvious, then, that three points are to be borne in mind in arranging road-van services and in loading the vans. First, the quantity of traffic for any one station loaded in a road van must be kept within a margin that will enable the goods to be discharged in a reasonable time at a wayside station. When the quantity of traffic exceeds this limit, it should be loaded to the transhipping point nearest the junction at which the road-van service commences. Second, the goods should be loaded in the van in station order, the goods for the station which is first called at being placed nearest the door, those for the second station adjacent to those for the first, and so on. Third, the doors should be on the side which will be adjacent to the platforms at the stations; and to ensure the vans being marshalled properly on the trains a distinctive label should be affixed to

.....RAILWAY

UNENTERED SLIP AND TEMPORARY INVOICE

Issuing Station..... .....

Checker.....

Date and Time Unloaded ....

Wagon No..... .. ..

Received from . ...
(Insert Station and Company.)

From... .. . .to ....via. ... .
(To be filled in when form is used as Temporary Invoice.)

Sender's Name and Postal Address.	Name and Postal Address of Consignee or Marks.	No. of Articles or Packages.	Description of Goods.	Weight.			How disposed of.		Who pays Carriage, i.e. "Carriage Paid", or "Carriage Forward".
							Wagon.	Station to.	
				Cwt.	Qr.	Lb.			

Fig. 4

the side of the van, so that it may be coupled to the train in such a manner that on arrival at destination the proper side of the wagon may be nearest to the platform.

There is yet another load, the " composite " load, i.e. a load consisting of a fair quantity of traffic for each of two or three adjacent stations, so that the first station, after removing its portion, can add any traffic it may have for the second station and send the wagon on.

Goods will frequently be left over at the close of working, and it is most important that a careful and complete record should be made of such goods. This record must be currently dealt with to ensure the goods being sent away without further delay, and to trace all goods which, at the time of loading the traffic, for some reason or other, could not be identified and dispatched. Each article left over in this manner should be specially attended to.

Importance of Good Loading.—A word or two as to the manner of loading and sheeting so as to avoid damage to the goods in transit. The pressure under which the loading is conducted is often an awkward opponent of careful loading, but it is a factor which must not be allowed to become predominant. Once admit that time is your master, and you are economically unfit. A load hurriedly made is pretty sure to be a load badly made. It may appear superficially to be in good order, whilst all the time possessing the seeds of disintegration and destruction.

A load must be carefully built up, with the heavy goods placed undermost, and so packed as to render undue oscillation *en route* an impossibility. Scotches for barrels, and such like easily moved articles, and plenty of straw to prevent chafing by edges and corners of boxes, &c., must be used. Above all, a load should never be dispatched which is built up at either end of the wagon so as to leave a space, complete or partial, in the centre. A load commenced at either end must be made level before dispatch if it is to travel with safety. Common sense dictates that articles likely to contaminate other goods should not be loaded in proximity to them.

Sheets should be drawn quite taut over a load, and a sheet supporter is a valuable acquisition for preventing hollow sheeting. The collection of rainwater in the hollow of a sheet is neither good for the sheet nor the goods which the sheet is provided to protect.

Average Loading.—The loading of the wagons so as to obtain the fullest possible return is always an urgent problem, and well repays the bestowal of constant attention upon it. Loading the wagons to their fullest capacity, when the volume of traffic so permits, means that shed accommodation is utilized to the utmost: a good average means fewer wagons, consequently it is not necessary to berth as many wagons as it would be were no attention paid to the necessity of obtaining a good average load. If 10 tons are loaded in two wagons instead of three, you only need two wagons placed in the shed for loading, and the length of two wagons only instead of the length of three is occupied whilst you

dispose of the 10 tons; and at the same time it is possible to provide loading accommodation for a greater number of destinations. Similarly, you are not so liable to be pressed for siding accommodation, as you have decreased the number of wagons that require to be housed. It must, however, be recognized that the nature of the traffic dealt with in sheds (or warehouses) is often of a fragile and bulky nature and does not permit of the wagon being loaded to its capacity as measured by tonnage, but if measured by cubic capacity occupied it may be quite full.

High-capacity Wagons.—The amount of shunting and marshalling to be done decreases in proportion to the increase in the average load; and the number of trains may be reduced, thereby economizing engine power. Akin to this is the question of high-capacity wagons. For instance, take a train of forty wagons of 7-ton capacity, each wagon being fully loaded to its maximum capacity, tare weight, say 5½ tons per wagon, and we get—

Weight of goods, 280 tons.
Weight of wagons, 220 tons—500 tons in all.

Assuming that 500 tons is the gross load that can be conveyed and that 15-ton wagons were used with a tare weight of 8 tons, then the weight of the goods and the weight of the wagons for both classes of wagons would be as follows:

Description of Wagon.	Number of Wagons used.	Weight of Goods.	Tare Weight of Wagons.	Gross Load.
7-ton	40	280	220	500
15-ton	22	324	176	500

It will be observed that whilst the gross train load remains the same the " paying load " has increased by 44 tons, or approximately 16 per cent.

Apart from weight, there are fewer wagons to sheet and close down, and more time, therefore, for loading the goods. In fact, nearly all, if not all, the arguments that can be adduced in favour of the introduction of high-capacity wagons apply with equal force to the question of average loading.

Another important point to be borne in mind is that by utilizing the wagons to the utmost capacity, and introducing high-capacity wagons, you not only reduce the number of wagons moving over the line, but you do not require to construct so many wagons in proportion to the traffic.

The one great danger to be guarded against, as arising from efforts to improve the loading of the wagons, is the possibility of increased risk of damage to the goods by the building up of too many tiers of goods, with the consequence that the lower tiers suffer damage by the weight of the goods loaded upon them. Careful supervision of the loading should remove this danger, whilst a practical remedy can be found in the pro-

vision of movable decks, to be raised or lowered as required, thus increasing floor space 100 per cent or more, particularly when loading fruit, &c. The best way to secure efficiency in loading is undoubtedly to construct covered vans in lieu of open trucks. In a covered van a load can be built up to the roof with safety and no sheeting or roping is required, and there is no danger of goods falling off a load. The increased floor space, which the proposed movable shelf or deck would afford, would enable a van to be fully loaded with sundry goods with very small risk of damage.

Among the various means employed to maintain a good average wagon load the question of regular returns should not be overlooked. It has been mentioned that different commodities have different loading qualities, i.e. those of a heavy nature can be loaded to a weight approaching the maximum capacity of the wagon as measured by tons, but the same wagon when conveying another commodity which is light in proportion to its bulk, or where its fragile nature does not permit of the traffic being loaded to the maximum, will load much less. Obviously, then, the ideal wagon-load return would be one which compared the loading of the different commodities in the different capacity wagons. Such a return, however, would be much too laborious to undertake regularly, but occasional tests are of real value. The return, usually compiled in four-weekly or calendar monthly periods, gives for each loading point the number of wagons and the tonnage loaded subdivided into the three main classes, viz. merchandise, coal class, and other minerals, in a form following that shown below:

Loading Point.	General Merchandise.			Other Minerals.			Coal Class.		
	No. of Wagons.	Tons.	Average Wagon Load.	No. of Wagons.	Tons.	Average Wagon Load.	No. of Wagons.	Tons.	Average Wagon Load.

Comparative figures should be shown for the corresponding period of the previous year, and the figures should be summarized under District and All Line Totals.

The superintendent responsible for the loading of goods wagons should scrutinize these figures, and where there is a noticeable reduction in the load obtained, institute inquiries as to the cause.

CHAPTER III

Unloading and Delivery of Traffic

On the arrival of a train at the delivery station, the first duty is the collection of the invoices (which are in many cases nailed to the wagon sides), so as to place them in the possession of the delivery clerk at the earliest moment possible. Where the passenger-train service permits, the invoices should be dispatched thereby, so as to get them to destination well in advance of the goods. As we are dealing with the clerical working separately, we will not here follow the various operations conducted by the delivery clerks.

An examination of the invoices and wagons on arrival is necessary, so that, where required, directions to the yardmen can be issued by the delivery clerk and chalked upon the wagons so as to prevent full-load traffic (which can more conveniently be dealt with in the open, or placed in position for unloading by a trader's own men) from being put into the shed with the wagons loaded with sundry goods, &c., or vice versa.

A primary necessity is the regulation of the staff so that the men come on duty in good time to cope with the traffic immediately on its arrival. It is not economical to allow an undue accumulation of traffic between the time of the first arrivals and the time of the commencement of unloading; but at the same time it is not economical to commence unloading before there is sufficient traffic on the station to make the unloading as nearly as possible a continuous operation. The arrivals (number of wagons) and the unloading (number of wagons) should be frequently compared so as to ensure the work of unloading keeping pace with the arrival of the traffic, and thus avoid congestion of wagons in the station yard and the increased expense of dealing with it.

Having, then, set the shed in readiness for the unloading staff to commence operations, the invoices are obtained from the delivery clerk and handed to the unloading checkers according to the wagons which are to be unloaded. The entries on the invoices will have been marked by an expert with the number of the post, which agrees with the number of the " delivery district ", to which the goods are to be trucked for loading on the drays for delivery, or into wagons for further transit, so as to facilitate the work of unloading and to simplify the checker's work.

Unloading Checker.—An unloading checker should be able to keep at least two men fully employed in trucking goods from the trucks to the loading berths or posts. He is responsible for seeing that each package unloaded has an invoice entry for it, for noting any damage that may have occurred, and intelligently recording, where possible, the apparent cause of the damage.

If the checker cannot find an entry for any package, he must make an

entry upon an " unentered " slip. Careless recording of unentered goods is a prolific cause of delays, wrong deliveries, improper application for charges, &c. If the checker has an entry and cannot find the goods, he must endorse the entry to the effect that the goods are not to hand. As many discrepancies of this character are bound to arise even in the most favourable circumstances, it is profitable to employ a man to keep in touch with the unloading and to pass to him all such recorded discrepancies (goods unentered or not to hand), so that, where it is possible, he may trace the entries or goods and connect the one with the other, and thus prevent further trouble or delay.

Not all the goods are entered for delivery; but a fair proportion will be received entered to the order of a person or firm, who will not necessarily be the ultimate consignee. A number of orders relating to these goods will, however, have been received at the station in advance of, or at the same time as, the arrival of goods. A proper system of recording the orders relating to these goods immediately on arrival of the orders, and of connection with the invoice entries before the unloading of the goods, will enable many consignments entered " to order " to be delivered concurrently with the directly consigned goods, and thus facilitate the flow of the traffic, prevent delays, and obviate the necessity of running such goods to the " order " place or " warehouse ", and the unnecessary issue of advices and making of entries in the warehouse books.

Delivery Sheets.—The " delivery sheets " will have been passed to the foreman in charge of the unloading at the same time as the invoices if the time at the disposal of the delivery clerk between the receipt of the invoices and the unloading of the wagons has been sufficient to enable the preparation of the delivery documents to be completed. The simpler method at stations having several delivery drays is for one entry only to be entered on a delivery sheet, and the number of the loading post to be entered on the sheet. The sheets are, immediately on the commencement of the unloading of the goods, placed on pegs corresponding in number to the delivery posts, so that the delivery documents are at the disposal of the loading-up staff immediately they begin to receive the goods from the wagons. The utility of this is obvious. Each sheet having but one entry, it is easily possible to check the goods on to a dray without delay, and it follows that as soon as a dray is completely loaded the sheets corresponding to the loaded goods are also quite ready for passing to the cartage department.

The adoption of the single-entry delivery sheet, however, is a matter which has received very careful consideration by most railway companies, and whilst the system has undoubted advantages over the multiple-entry delivery sheet, the advisability or otherwise of introducing it is largely dependent on local circumstances, having in mind the method of dealing with the traffic in the warehouse; for example, the question of substituting the single-entry in place of the multiple-entry delivery sheet was being considered at a large warehouse, but it was found that such a change was

not practicable. At the particular station under inquiry the goods had to be taken from the wagon and benched, the rulleys being later loaded by rulley loaders, the particulars of the traffic loaded on the various rulleys being recorded by the loaders on what was known as " loading slips ". Here the single-entry delivery sheet was not a workable proposition, as the unloading from the wagon was nearly always in advance of the loading to rulley, and it would be a slow operation for the loaders to pick out special goods from the heaps to connect them with the delivery sheets which had subsequently been made out.

Discrepancies in working, such as goods at a loading berth without sheets, or sheets without goods, are bound to arise; and here again the " discrepancy " man is usefully employed in straightening out the tangled threads by making the necessary connections between sheets and goods. This corrective work, when done concurrently with the handling of the traffic, is more economical and certainly more satisfactory than attempting to clear up the trouble at a later period in the working.

The delivery sheet being a document of legal importance, it requires to be treated with care and safeguarded against loss, and to this end a signature for each sheet should be given and obtained by the shed staff, a process which is greatly facilitated by the presence of a distinctive number on each sheet. The number should be printed or stamped upon the sheet to prevent duplication.

Similarly, when the traffic is loaded on the drays for delivery the sheets are handed to the cartage-department officials, whose signature for receipt should be obtained, and when handed to the carmen for the delivery of the goods they should be recorded in the weighbook and checked back on the carman's return to the station.

Warehousing and Private Carting.—With the highly developed system of fast trains and quick transit and delivery of goods of to-day, warehousing is not such an important matter as formerly. The great bulk of traffic warehoused is at the delivery station, and the first essential is to see that all such traffic is advised (providing an order for its disposal is not in the possession of the station agent) to the person in whose name the goods are warehoused.

The warehouseman must check the goods both into and out of the warehouse, and record the transaction in the warehouse book. Running stocks should be balanced with the records at least monthly.

It being quite within the option of a trader to perform his own carting, it follows that a sensible proportion of the traffic is carted by the traders themselves or by agents. Traders' carts cannot be expected to take a turn on the rank with the companies' carts, and it is best, therefore, where possible, to set aside a portion of the deck at which the traders can set their carts and unload or load their goods when the goods are of a miscellaneous nature. When the goods are in large quantities, or of a very bulky nature, and require the use of one wagon for a consignment or consignments to or from one place, the wagons should be stabled on a

COST OF DEALING WITH COLLECTED AND DELIVERED AND TRANSHIP TRAFFIC AT THE UNDERMENTIONED WAREHOUSES, ALSO THE MAN-HOURS WORKED, DURING THE..... . ...

Warehouse.	Year.	Wages Paid.			Tonnage dealt with.					Cost per Ton.	Man-hours Worked.	Tons Handled per Man-hour.
					Collected and Delivered.	Percentage of Total.	Transhp.	Percentage of Total.	Total.			
		£.	s.	d.						Pence.		

Fig 5

siding convenient both to the traders and the railway company. To this end they will require to be placed in a position out of the way of the movement of the general traffic.

Handling Costs.—The handling of goods traffic is an expensive operation, and a close check is necessary to see that the work is accomplished as economically as the circumstances permit. Here again actual cost is not the truest measure upon which to base comparisons, as the rates of wages paid to the handling staff are not controlled by the officer responsible for the efficient handling. He is, however, responsible for seeing that the traffic is moved with minimum staff, and the working results as expressed by the weight moved per man-hour, or per day, will reveal whether or not efficient working obtains. A daily return for the main stations showing such information is desirable, and the particulars should be summarized weekly and monthly so that the chief officers may review the results in the light of those obtained for previous periods. Fig. 5 illustrates the form such a return might take.

CHAPTER IV

Clerical Work at Stations

Consignment Notes.—The basis of the whole of the clerical work is the consignment note (fig. 1, p. 202); and consequently this is a most important document. It has been seen already that this document is made out by the public, but the work is sometimes done in such a manner that it is necessary at the larger stations to make out subsidiary notes, known as "extract" notes. There are two other kinds of note, one known as the "unentered" note, on which goods are entered when unloaded from a van without the checker being in possession of an ordinary consignment note; the other is the "found on stage (shed or bank)" note, and is used for goods for which, when they are loaded in the wagons, a note cannot be traced.

There are in addition several forms of consignment notes designed for use under certain conditions, such as:

(*a*) When carriage is to be at "owner's risk" at reduced rates.
(*b*) When goods are damageable and not properly protected by packing.
(*c*) When explosives and inflammable goods are consigned.
(*d*) When sender declines to insure articles enumerated in the "Carriers Act" exceeding £10 in value.
(*e*) Perishable traffic at owner's risk reduced rates.

The premier working office, therefore, is the "invoicing" office, and it is to this office that the consignment notes are sent immediately the shed staff can liberate them.

It is unfortunate that in the invoice office, where the foundation of the whole clerical structure is laid, the pressure of time, or, rather, the lack of time, is most keenly felt; it is rather remarkable that a partial remedy for errors arising from this will probably be found to lie in an increase of work, as will be explained in the next chapter.

The Invoice.—The document produced in the invoicing office is, of course, the " invoice ", specimens of which are given in figs. 6 and 7. As previously stated, all goods are invoiced under one of the following heads:

1. Goods carted.
2. Goods not carted.
3. Other minerals.
4. Coal class.

Numbers 1 and 2 are entered on the " Goods " invoice, and 3 and 4 on the " Minerals " invoice.

The invoice usually contains the following information: Date, progressive number, issuing station and railway; destination station and railway, route by which goods travel, owner and number of wagon—given in the heading of the document; and in the body of the document, in tabular form, the number of consignment note, name of sender of the goods, name and residence of consignee, number, species, and marks of goods, weight of goods and whether " carted " or " not carted ", rate at which carriage is chargeable, amount of " paid on " if any, amount of carriage and whether paid by sender or payable by consignee. Further columns are for clearance reference, charges for cartage at destination, amounts under- or over-charged, and columns in which to extend amount payable in order that such amounts can be totalled and balanced with the ledger accounts or cash books or bills.

Specialization in the Office.—The great advantage of each consignment note being restricted, so that goods for no more than one destination shall be entered on it, can now be demonstrated. Clerks can specialize in the rates for certain stations, and proficiency in working and economy in documents can be effected by the clerks taking specific stations to which to invoice. Such single-entry (destination) notes can be passed direct to the clerks who have specialized the stations named on the notes. If this arrangement of converting all notes into single-destination notes by means of " extract notes " is not carried out in those cases where two or more destinations have unfortunately been inserted, then it is necessary to pass the notes containing entries for two or more destinations to two or more invoicing clerks; and to prevent invoices missing the proper service of dispatch, it is necessary to sort the notes to the clerks dealing with the earlier-dispatched invoices and re-sort for the following dispatches, and so on until a note is cleared. Obviously this is a complicated arrangement compared with the single-entry work, which only requires the notes to be sorted to one clerk; and traders, if they could but appreciate this fact, would not hesitate to instruct their forwarding clerks to carry out the single-entry note arrangement.

________ RAILWAY. GOODS INVOICE. *Pro. No.*________

First Tranship Station.	Date.	Invoice Number.	From.	To.	Railway.	Via.	Tranship Station.	Unloaded.		Reloaded.			
								Date.	Checker	Date.	Wagon No.	Station to.	Checker.

Sender.	No. of Consignment Note.	Owner and No. of Wagon.	Reference to Delivery Book or Sheet.	Consignee and Address.	Number of Articles.	Description and Marks of Goods.	Actual Weight of Smalls.		WEIGHT.												Rate.	Paid on.			Paid.			TO PAY.			Cartage.		Undercharged.		Overcharged.		Porters.			Posted.						Folio.
									Carted.				Not Carted.				Foreign Goods at Rates at or below 5*s.* per Ton.																													
							Qr.	Lb.	Tons.	Cwt.	Qr.	Lb.	Tons.	Cwt.	Qr.	Lb.	Tons.	Cwt.	Qr.	Lb		£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	

Checker's remarks as to condition, loss, &c., to be inserted here.

Invoice arrived________ Goods arrived________ Goods unloaded________

Fig. 6.—Specimen Goods Invoice

________ RAILWAY. *"MINERALS" INVOICE *Pro. No.*________

	Date.	Invoice Number.	From.	To.	Railway.	Via.

Invoice arrived________

Traffic arrived________

Sender.	No. of Consignment Note.	Owner and No. of Wagon.	Reference to Delivery Book or Sheet.	Consignee and Address.	Total No. of Wagons.	Description of Traffic.	WEIGHT.						Rate.	Paid on.			Paid.			TO PAY.			Cartage.		Undercharged.		Overcharged.		Porters.			Posted.						Folio.
							Company's Wagons.		Other Railway Co's Wagons.		Traders' Wagons.																											
							Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.		£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	

* *Traffic in Classes A and B of General Railway Classification charged at rates noted for 4-ton lots or above. (Coal, Coke, Patent Fuel, Slack, Breeze, Cannel, Coal Cinders, and Shale Coal to be invoiced on a separate Form from that used for other Minerals in Classes A and B.*

Fig. 7.—Specimen "Minerals" Invoice

Practice differs as to the exact mode of invoicing, but the most economical method seems to be the separation of the charging from the remainder of the work.

Charging.[1]—An important branch of the goods department is the Rates Section, upon which devolves the duty of arranging the rates to be charged for merchandise and mineral traffic, the basis of which is the classification and the schedules of maximum charges contained in the Railway Rates and Charges, Order Confirmation Acts of 1891 and 1892.

One of the principal objects of classification is to distribute the burden of transport so as not to hinder industry or restrict the flow of traffic, and this end is attained by placing in the higher classes traffic which can reasonably bear a heavier rate, and sparing as far as possible the traffic which might cease to pass if rated too heavily.

The heads under which merchandise traffic is at present divided are:

Goods and mineral, subdivided into classes A, B, C, 1, 2, 3, 4, 5;
Animal class;
Carriages;
Exceptional class—articles of unusual length, bulk, or weight, bullion, precious stones, &c.;
Perishable merchandise by passenger train;
Small parcels by merchandise train;
Returned empties;

but, in accordance with the provision of the Railways Act, 1921, a revised classification will be brought into operation, at some date in the future still to be decided, in which goods and minerals are divided into coal class, including coal, coke, and patent fuel (now included in classes A and B), and numbered classes 1 to 21 for other commodities.

The three lowest classes, A, B, and C of the present classification in ascending order, represent articles usually sent in large quantities and charged at rates which apply from station to station, whilst the numbered classes 1 to 5 contain commodities a large proportion of which is handed to the railway companies in less than wagon-load consignments, and is usually loaded and unloaded in covered sheds or warehouses. The traffic falling within these classes is collected and delivered by the railway companies or their agents, the rates charged including an amount for the service of cartage.

The growth of commerce, new inventions, changing values and methods of production, and the increasing use of specific names for preponderating articles has necessitated amplification and in some cases modification of the Parliamentary classification of goods and mineral traffic, but this is provided for in the general railway classification of goods by merchandise trains issued by the railway companies.

Corresponding to each class, the Order Confirmation Acts of 1891–2 provide scales of charges for goods and mineral traffic, the charges authorized being:

[1] For fuller information on Railway Goods Rates see pp. 173–178 *et seq.*

" Conveyance ": per ton-mile of distance carried, varying in amount for each class, and graduated to give a lower charge per mile for longer distances.

Station and service terminals: for the accommodation provided and services rendered by the railway companies.

Reasonable amounts for services rendered and accommodation provided at or in connection with private sidings and for other miscellaneous services, &c.

The most important function of a rates office is the quotation, for various commercial reasons, of exceptional rates below the maxima which the companies are entitled to charge, and the following are the principal factors governing these reduced rates:

Large quantity of traffic.
Development of industries.
Competition by other modes of transport.

For many articles carried in all directions, and under similar conditions, the exceptional rates have been arranged in some general relation, and one of the objects of the increased number of classes in the new classification has been to sweep into a class rates in extensive operation at about the same level and so reduce the number of exceptional rates individually noted, which at the present time runs into many millions.

At every station dealing with goods or mineral traffic there is kept for public inspection a copy of the classification and rate books showing the distance and rates in operation for the time being to all places to which traffic is booked, including exceptional rates as well as the class rates corresponding to the classes of the classification.

The work of charging out the carriage items requires an expert knowledge of some hundreds of rates both of the ordinary A, B, C, and class 1 to 5 rates, and the numerous " exceptional " rates with which the rate books are overcrowded. With the fluctuations in the rates charged which have occurred from time to time during the past few years, the work of the charging clerks has become even more complicated. The work of invoicing without charging consists mainly in mere transcription of the details from the consignment notes; in a fair proportion of entries it also requires a knowledge of the authorized routes by which the goods travel. Obviously the work of transcription is elementary in comparison with the work of " charging ", and to employ the time of the expert " charging clerk " in mere transcription work is an extravagance.

An objection that may be raised to the division of the work into " elementary " and " expert " is that the clerks engaged upon the elementary work are prevented from progressing into the expert work, consequently vacancies arising in the expert section result in at least a temporary weakening of the efficiency in that part of the work. This objection is met by the expert section working upon the consignment notes and inserting the rates and charges on those documents. This done, the notes are passed to the elementary section, which transcribes the whole of the details, including rates and charges, to the invoice. The elementary clerks are

by this means enabled to become conversant with the rates and charges of the district or stations on which they are employed, it being by far the better method to allocate a " branch " or " district " to one clerk, so that he may become expert on that district. The economy arising from this method of working lies in the restriction of the expert and therefore more highly paid portion of the staff; but with the introduction of the typewriter for invoicing female labour is now largely employed on transcription work, and the organization under such circumstances is for the rates, routes, and charges to be inserted by the senior clerks.

" Pen-and-ink " and " Pencil-and-carbon " Invoicing.—The system originally in vogue of making out invoices by pen and ink is now almost obsolete, and the pencil and carbon system has been almost wholly substituted at the larger stations by the typewriter, but it will be appreciated that it would be uneconomical to introduce the typewriter at those stations where the work is insufficient to keep the machine employed for the major portion of its time.

The degree of perfection to which the typewriter has been brought at the present day has, in one fell swoop, removed all the disadvantages of handwritten documents, and consequently the " typewritten-invoice " system easily carries the day. Idiosyncrasies of varying handwriting disappear entirely in the attainment of the uniform legibility of the typewritten invoice. Greater speed in the work is possible, and as many copies can be made at one writing as are necessary. The exact legibility which is given in a typewritten document does not need demonstrating: it is immeasurably superior to pencil work, and its effect is felt and appreciated both in the indoor and outdoor working. The writer has something to say, further on, as to other developments only rendered possible by the advent of the typewriter into the railway business.

Check Systems.—Error in some degree is inseparable from the haste with which invoicing work is necessarily performed. To counteract this, and to keep the percentage of error as low as possible, it is desirable that at least a portion of the work should be checked before dispatch of the documents, relying upon the moral effect of this partial check to produce a general standard of efficiency. It should be the aim of those concerned to obtain a complete check of the rates and charges columns of the invoices before dispatch, so as to bring the under- and over-charges to the irreducible minimum.

A word or two as to the dispatch of invoices. Two objects are to be kept in mind: one the giving to the invoice clerks as long a time as possible for preparation of the documents, and the other the delivery of the documents at destination well in advance of the goods. The first object will assist accuracy, and the second will facilitate quick delivery of the traffic.

The Delivery Office.—The delivery office ranks second in importance to the invoice office, as being the department sharing with it the manipulation of the traffic. Whereas the invoice office deals with documents

circulating over the whole kingdom and beyond, the delivery office is, exclusive of shipping and reforwarded traffic, only concerned with the traffic for a circumscribed area. Its work rests largely upon the foundation already laid by the work of the invoice office.

The recording of every invoice immediately upon receipt must be an absolute rule of working, as must also be the checking-off of the wagon arrival lists in order to see that invoices have been received for each wagon.

After the rates and charges for at least the " to-pay " entries have been checked, the invoice entries require, at the larger stations, to be marked with the number of the delivery district, so that the work of sorting the delivery sheets and the porterage of the goods from the wagons to the delivery drays can be facilitated.

The slips on which the unloading checkers record the " unentered " goods are issued from this office, and it is advisable to number them progressively before issue, so as to prevent them straying about after use at the truck side. It is extraordinary how a number adds importance to a document of this character.

Single-entry Delivery Sheets.—The work of writing the delivery sheets is important, and we have no doubt that the best system is that known as the " single-entry " system (see fig. 13, p. 245) where the circumstances at the station permit of this being introduced.

By this system no delivery sheet contains more than an entry of the goods on an invoice for one consignee; other systems are those which necessitate a delivery sheet having many entries for various consignees residing in any one delivery district.

The advantages of the " single-entry " system are that a " sheeting-out " clerk, i.e. one who writes out the delivery sheets, can transfer the whole of the entries from one invoice to the necessary number of delivery sheets, and the sheets can be readily sorted in the shed to correspond with the consignments loaded on any one van or dray. With the contra system of many entries on a delivery sheet the clearing of an invoice by one clerk is not easily possible; for if a clerk is entering for one delivery district, the invoices would have to wander through the office until all the entries had been transferred to the respective " district " sheets; and when this was accomplished it would probably happen that a percentage of the entries on a sheet would need to be transferred from that sheet, because the loader of the goods at the time of loading could not find the goods, or there was not room on the dray for them. On the other hand, if the traffic is loaded by " slip ", and the sheets made out from the slips, it would ensure each sheet being in agreement with the load, but the dray would be kept idle whilst the sheets were being written out in the office. Further, the single-entry system enables the clerk to produce the account note in the same operation as writing the sheet, by aid of a sheet of carbon paper, thus avoiding the separate writing of the account form; this is not possible with the many-entry-sheet system. Not only does the single-entry enable one to produce the two documents at one operation, but it ensures that

both shall agree; it also enables one to make copies of the sheets with but little extra labour if they are desired. The typewriter has also been introduced into this branch of the work with marked success.

The Use of the Typewriter.—This section of the work cannot be passed without further reference to one of its latest developments. This is the introduction of the system by which several documents are produced in one writing. This system was already a familiar one in business houses, in the shape of loose-leaf ledgers and account bills; in the railway world it takes the form of invoice—the foundation document—and delivery sheet and account form—the subsidiary documents. By use of the typewriter all the three documents mentioned are written simultaneously, and of course the lines of entry on each are in entire agreement.

The system brings increased accuracy in its train, and renders it possible to extend the time available in the invoicing office, because of the lesser need for the invoices to be at destination in advance of the wagons. The system is also directly economical, as although it may involve an additional expenditure of time in the invoice office, yet there is a greater compensating saving of time in the delivery office, thus yielding a net economy. Another substantial advantage is that all the documents are transcribed direct from the consignment note. The system does not interfere in any way with the making of several entries on an invoice, and has therefore no prejudicial effect on the work of abstracting. A fair proportion of the invoices which are issued have, however, only one entry per invoice, and for these it is better to have each form identical in shape and size, and to make out the whole at the forwarding point.

As the production of the account form with the delivery sheet followed on the introduction of the single-entry-sheet system, so has the simultaneous production of the invoice entry, delivery sheet, and account form followed; and doubtless other similar developments will shortly manifest themselves.

CHAPTER V

Goods-train Working

The efficient and economical working of goods and mineral trains necessarily engages a great deal of attention on the part of the management, because it forms one of the largest items of expense in maintaining necessary services.

It was, years ago, the practice of certain railways to use receipts per train mile as a measure of train-working efficiency, but as a result of the abnormal conditions prevailing since the Great War, when railway rates have varied from time to time, comparisons with pre-war periods have been entirely, and with post-war periods considerably, vitiated. Under such circumstances it would be fallacious to introduce any monetary unit, either

receipts or cost, for the purpose of judging the work of the officer responsible for train working, as these fluctuate through circumstances over which he has very little, if any, control. The principal aim of the officer responsible for train working is to see that:

(1) Trains are loaded efficiently.
(2) Services are regularly obtained.
(3) Punctual running.

No. 1 is a combination of speed and load, and most railways now compile, for the guidance of those responsible for the loading of trains at the starting-point, tables showing the maximum loads either in wagons or tons which the different types of engines can economically haul over the various sections of line at the classified speeds. The hauling capacity of an engine is limited, but it is very desirable, from the point of view of efficiency in train working, that the load carried should be as near as possible the maximum which the engine can haul. Where such loads are expressed in terms of wagons, it is very difficult for obvious reasons to measure with any degree of accuracy the weight behind the engine. The correct measure of maximum engine loads should be in terms of tons, and thus enable reliable figures to be obtained of the actual load conveyed in relation to the maximum possible.

On certain sections of line the maximum load may be determined by the length of the train, which is governed by the length of the loop lines into which it may have to be shunted to permit of more important trains to pass.

Nos. 2 and 3 are bound together. Trains should as far as possible depart each day at a given time, and this can only be decided upon after careful consideration of all the governing factors, some of which are:

(*a*) Yard working at originating and terminating point.
(*b*) Connecting trains.
(*c*) Collecting of wagons in private sidings, &c.
(*d*) Density of line over which traffic has to pass at particular periods of day.

Check on Train Running in the District Superintendent's Office.—The check on train performance is obtained through the guard's journal (see fig. 8), which is prepared by the guard for every train run. The guards' journals should be in the hands of the district superintendent the following day for those trains for which he is responsible, and carefully scrutinized and explanations obtained from those concerned in all cases where excessive delay has taken place. The best organization of a district superintendent's office from a train-working point of view is for a train clerk to be allotted a certain section, and thus become familiar with the trains and the conditions of working in that section.

A daily record should also be kept for each train of the minutes late at starting and arrival points, together with particulars of the number of loaded and empty wagons conveyed, which should be totalled and summarized monthly in the following form:

FREIGHT GUARDS' TRAIN REPORT

_____ ____ __ ____ day Date____ _____ __ _____ 19 Title of Train.

Time of Train. .m.	Class of Train. Goods. Coal. Cattle. Truck.	From	To

No. of Train in Working Time-tables.

ENGINE.			Driver_____	Guard_____	Home Station _____	Tons.
No.	Class.	Home Station.	,, _____	,, _____	,, ,, _____	Brake Van No._____ Weight_____
			,, _____	,, _____	,, ,, _____	Brake Van No._____ Weight_____

Stations, Junctions, and Intermediate Sidings	Time Occupied. Booked Arr m.	Booked Dep m.	Actual. Arr m.	Actual. Dep m.	Shunting Mins.	Delay. Mins.	Loco. Mins.	Total. H.	Total. M	Remarks as to Detention at Stations and in running; when shunted for Trains to pass, give description and times of Trains which pass.	Loading (exclusive of Brake Van). Wagons Attached. Coal, Coke, and Patent Fuel. (1)	Other Minerals (2)	Goods and Live-Stock (3)	Empties.	Wagons Detached. Coal, Coke, and Patent Fuel. (1)	Other Minerals. (2)	Goods and Live-Stock. (3)	Empties.	Load on Leaving each Station. Coal, Coke, and Patent Fuel. (1)	Other Minerals. (2)	Goods and Live-Stock. (3)	Empties.	To be compiled in the Company's Statistical Department. Distance. Miles.	Area.	Coal, Coke, and Patent Fuel. (1)	Other Minerals. (2)	Goods and Live-Stock. (3)	Empties
Late Arrival										Total									Total Wagon Miles									

General Remarks, Occurrences to Train, and Suggestions for improvement of working_____

Show here whether Engine returned light or otherwise.

This Report to be carefully made out by the Guard, and *handed by him on completion of the Journey to the Station Master or Inspector*, who must forward it to the Superintendent of Operation by first train each morning.

Each wagon is to be counted as one wagon, regardless of the capacity of the vehicle, or ownership.

Any Guard not completing a train journey must hand this Train Report on to the Guard who relieves him, and the latter will be responsible for its completion.

State of Weather during Journey; if Wet, Frost, Fog, or Snow, between what points.

Fig. 8

[Facing p. 226, Vol. I.

Train.
Time
From
To
Number of times run during month

Minutes late.
Aggregate: At start
On arrival
Average: At start
On arrival

Load.
Aggregate: At start—loaded
empty
On arrival—loaded
empty
Average: At start—loaded
empty
On arrival—loaded
empty

A summary in this form would enable the district officer to see which trains were not maintaining a reasonable measure of punctuality, also those conveying less than the maximum load. If it is found that a train is conveying considerably less than its maximum load, it may be possible, unless a question of policy is involved, to dispense with it and spread its load over other trains. The importance of punctuality in train working cannot be too strongly emphasized, as delay to one train reacts upon others, and this affects the working at terminal points with subsequent delay to traffic, with all its attendant troubles such as claims, &c.

It will be very often found that excessive delay occurs at a particular point in consequence of the accommodation being inadequate, and information should therefore be compiled for one or two periods each year of the number of trains working over the various sections of line together with delays suffered. This affords a valuable guide in considering cases for widening of lines, &c., as it will be appreciated that punctuality of train working is impossible if congestion occurs through inadequate accommodation.

Check in Train Working in Chief or General Superintendent's Office.—The chief operating officer should be supplied monthly by his district superintendent with a summary showing the results for each train as outlined above, and this enables a general supervision to be exercised and to see how one district compares with another.

All companies are now required to submit to the Ministry of Transport each month the loaded- and empty-wagon miles worked. These statistics (which are dealt with more fully under Returns, pp. 111–112) afford a very valuable check on train working from a chief officer's point of view. Fig. 9 is a useful form of summary when wagon miles are combined

with train miles and engine hours, the various results being worked up as follows:

Train miles ÷ train hours = average speed obtained per train.
Wagon miles ÷ train miles = average number of wagons conveyed per train.

Wagon miles per train engine hour is one of the best measures of train-working efficiency, being a combination of speed and load. Any decrease in results shown through the wagon-mile statistics should be taken up by the chief operating officer with the district superintendent concerned.

Advantages of Full Train and Wagon Loads.—During the past twenty years the principal British railway companies have paid close attention to improving their net train loads, both by the building of more powerful engines and by the introduction of higher-capacity wagons. Figures which are available for one of the principal companies show that the average net train load, comparing 1902 with 1922, has increased by 70 per cent, and this means a considerable saving in wages, besides relieving congestion by having to run fewer trains. The whole question of goods-train working is naturally governed primarily by the number of wagons to be conveyed. Therefore it is the aim of the management to increase the paying load per truck, and to realize what this means it is only necessary to recollect that any one of the larger railway companies will dispatch from London probably 25,000 wagons per month, or say 1000 per working day. Now, whatever the average weight per truck, an increase of 1 cwt. per wagon would mean 25 wagons at 2 tons per wagon per day less, or say half a train. Assuming for argument's sake that the present average per truck stands at 3 tons, and that by skilful manipulation this is increased to 3 tons 5 cwt. per truck, it means that (taking the foregoing figures as an example) an increase of 6250 tons would be carried without adding to the number of wagons; or, in other words, if the average per truck had remained stationary, upwards of two thousand more wagons would have been necessary. It will therefore be conceded that from a goods-train mileage point of view, the first essential is to get the best use of the wagons. The next is the method of loading in yards and sheds.

Importance of Careful Marshalling.—All the companies having termini in London have a central point where the main-line express goods trains are got together and marshalled in junction order before being dispatched. These central points are fed by subsidiary trains bringing traffic from the stations and depots in the various outlying parts of London. To facilitate the work of sorting out and marshalling at the central point, the subsidiary trains should be so loaded and brought in as to give the minimum number of shunts to dispose of the wagons. The station agent should see that the wagons loaded in the shed are so placed that they can be drawn out ready marshalled, and should not allow wagons to be loaded indiscriminately. For instance, if two wagons are loaded to Leicester, one to Derby, one to Sheffield, and three to Nottingham, they should be

WAGON MILES, TRAIN MILES, AND ENGINE HOURS

Month of_____

Wagon Miles.				Hours.				Train Miles.		Train Miles per Train Hour.		Total Wagon Miles per Train Mile.		Total Wagon Miles per Train Engine Hour.		Loaded Wagon Miles per Train Mile.	
Goods.		Mineral.		Train.		Shunting by Train Engines.											
Loaded.	Empty.	Loaded	Empty.	Goods	Mineral.	Goods.	Mineral.	Goods	Mineral.	Goods.	Mineral.	Goods.	Mineral.	Goods.	Mineral.	Goods.	Mineral.

Fig. 9.—Monthly Summary showing Train Results

[*Facing p. 228, Vol. I.*

so loaded as to bring wagons for each of these places together, and not to have a Derby between the Nottinghams or a Sheffield between the Leicesters. Where traffic is loaded direct by the public into wagons, special attention must be paid to this, as the carmen are apt to go to any empty wagon available, and cases have come under notice where to get out half a dozen wagons so loaded, as many as eight shunts have been made. This is particularly the case at depots other than terminals where there is a want of siding room, and the public is dependent upon received loads of S. to S. traffic being cleared for the reception of the forwarded traffic. The writer feels satisfied that a great deal of engine power and time of the station staff could be saved if so many empty wagons were placed in one position regularly for the reception of forwarded traffic loaded in open yards by public carmen, without having to depend upon trucks cleared in perhaps half a dozen different roads, and to insist upon the wagons being loaded so that the empty wagons not loaded would stand last and not have to be moved. At the larger stations, where there is not room in the sheds for wagons to stand in marshalled order, they should be loaded as nearly as possible in the sequence required and in the order in which the trains are timed to leave.

How to Avoid Light Loading.—The question of the means of increasing the load per wagon by "skilful manipulation" was mentioned in the early part of this chapter, and the following will explain what was meant. At all goods stations a certain proportion of the traffic is brought in by the public and loaded by them in the yard. Assume the case of a load of confectionery in boxes, say 2 tons; the wagon when loaded is not more than half full, but in the ordinary acceptance of the term constitutes a full load. The foreman, however, should first ascertain what traffic he has loading in the "shed" for the same destination as the confectionery, and afterwards work this wagon into the shed to be made up, and so avoid the necessity for loading another. In the same way wagons started at any of the subsidiary stations, although containing 2 or 3 tons, may not be nearly fully loaded, and if for places to which there is a regular traffic passing from the central station or marshalling point, provision should be made for these to work up to the shed and be made up by the addition of such traffic before being put on the train. Before adopting this principle it would of course be necessary to make very careful investigation, and to instruct the stations concerned to which such wagons could be ticketed as "make-up" loads, and to lay down a service from the subsidiary station, to prevent the possibility of delay in making up. For, whilst it is very desirable to economize wagon stock, it is no part of the scheme to do this at the expense of the public by delaying traffic. This system is actually adopted by more than one railway company with good results. There is room for further improvement in railway wagons. What may be termed the ideal general-utility wagon—that having the greatest cubical capacity with the least possible tare weight, to give the greatest percentage of paying load to dead weight—is a matter very difficult indeed to solve. At the time of writing the 12-ton open goods

wagon is the type most favoured for standardization purposes so far as the railways in this country are concerned.

Continuous-braked Goods Trains.—This leads up to the question of the provision of trains consisting of vehicles fitted with vacuum brake. These were originally put on as the result of strenuous competition among the northern London companies, particularly in regard to the Scottish traffic. There is not the slightest doubt that, as the amount of traffic to be transported and the number of passengers increases, something will have to be done in order to get goods trains over the line as speedily as possible without hampering the passenger working. The ideal way would be to have a separate up and down line for goods traffic only, with loops at convenient intervals at which the meat, fish, and more-important express goods trains could pass the slower and less-important trains. As this is not altogether practicable, it means that several of the more important express goods must be vacuum-fitted throughout, and travel at such a speed as will enable them to take turn with passenger trains. The main question to decide is what is the greatest weight of a vacuum-fitted goods train that can be hauled at such a speed as will enable it to hold its own with a passenger train. If this weight is to be limited to, say, 400 tons, the position would be worse than before, as it would result in more trains running. What is wanted is an engine capable of taking a train at an average speed of 45 miles an hour with a dead weight of 500 tons and without restriction as to number of axles, so long as the vehicles are provided with oil axleboxes; and to make a greater use of the line by turning these trains in between passenger trains and allowing them to run at least 100 miles without stopping, whenever necessary. Unfortunately British railway companies have not the advantages of other countries in the construction of rolling stock which can be adapted to fast speeds, as, owing to the awkward construction of many of the terminal stations, and the fact that want of room prevents the sorting of wagons other than by turntables, the wheel base is naturally restricted; while, as some of the principal goods stations, not only in London, but in the provinces, are on two levels, necessitating the use of hydraulic lifts, the length over all is also generally curtailed. Provided that the vehicles have a wheel base of 10 ft., are fitted with oil axleboxes of the type generally found on passenger trains, and are fitted with vacuum brake, there appears to be no reason why a train of forty or fifty such vehicles, representing a gross weight of 500 tons, should not be hauled at 45 miles per hour (average) if suitable engines were built for that purpose. Such a system of working our goods traffic is bound to come sooner or later, as with an ever-increasing population and ever-increasing merchandise traffic it is obviously impossible to conduct the business of transportation on the old methods of goods trains with grease axleboxes, loose couplings, and no brake power, jogging along at an average speed of 18 miles per hour.

Mineral-train Mileage and High-capacity Wagons.—The foregoing observations refer, of course, to express and fast goods trains, and, so

far, mineral and coal trains have not been touched upon at any length. That there has been a large advance in the curtailment of train mileage under this head will not be denied, as the four companies have each brought out more powerful engines, some of them capable of hauling upwards of 1200 tons gross weight.

A great deal has been said and written on the subject of high-capacity wagons. All companies have realized the advantages of high-capacity wagons for suitable commodities, and the tendency is to concentrate on a conveniently large wagon. There is, however, a limit to the extent to which larger-capacity wagons are being utilized, and this is attributable very largely to the number of privately-owned coal wagons which are in use to-day. Whilst the present private wagon shows some improvement in capacity on former years, the increase in this respect has not been exploited far enough from the railway companies' point of view, and a case is cited later on in this chapter showing that some inducement may be desirable in the shape of concessions in rate before private firms can be induced to fall in with the large-capacity wagon, although such a wagon must also have certain advantages to them (probably not so great as to the railways). It will mean less storage accommodation in the colliery yards and sidings, and where, as is often the case, shunting is done by the colliery companies' engines, the benefits of fewer wagons in consequence of bigger wagon loads lie with the private owner as well as the railway companies.

Merchandise traffic does not offer the same scope for the introduction of high-capacity wagons, as for this class of traffic a wagon with a capacity of about 12 tons is probably the most suitable type for general use, although covered vehicles of a much higher capacity have been introduced successfully for road-van services.

There cannot, however, be any doubt that in the case of traffic such as coal conveyed for shipment in train loads where there is a constant flow between the collieries and the shipping places, as, for example, from the Durham and Northumberland collieries to the north-east coast ports and the South Wales collieries to the shipping places on the Bristol Channel, the advantages to be gained by the introduction of the high-capacity wagon are very real. It should, however, be made clear what is meant by the terms "high-capacity" and "low-capacity". By the former is meant a wagon of 20 tons capacity, and the latter 10 tons.

From a train-mileage point of view the aim of a railway company is to get the maximum paying load per train. Here the high-capacity wagon holds the advantage, because coal generally loads to the maximum capacity of the wagon, so that the paying load in the case of the high-capacity wagon is double that of the low-capacity wagon; but the tare weight is not increased in anything like that ratio, so that the paying load per cent of the maximum gross load the engine can haul must be greater when the train consists of high-capacity wagons.

It is also acknowledged that when the load of a train is concentrated it is much easier to handle inasmuch as it takes less effort to start, and when

running there is less risk of couplings breaking when changes of gradient are frequent and considerable. There is also less friction on the wheels on the rails in view of the reduced number of axles required for a given tonnage.

On one of our large coal-carrying companies, where wagons of both high- and low-capacity are in use, permission is given for the maximum gross loads laid down in its tables to be increased by 15 per cent when the train is composed of 20-ton wagons, which points to the operating advantages accruing from the use of larger wagons.

These train-mileage advantages appeal equally to the railway company if the traffic is conveyed in private owners' wagons, and that this has been appreciated is evidenced by the fact that quite recently one of our larger coal-carrying companies, where the traffic is carried in private wagons, has made the offer of a reduction in the rail rate if the colliery companies introduce 20-ton wagons in place of the present ones, which are anything from 8 to 10 tons capacity.

All the economies of increased wagon loads such as reduction in the number of wagons to be shunted, minimizing of use of storage lines, and in those cases where railway wagons are used—the reduced maintenance and interest on the capital cost apply with equal force in the case of mineral wagons as in goods wagons.

The Train Control System.—The capacity of a set of metals is limited in the number of trains which can be got over it in a given time, and the majority of sections of line have to be utilized for the passage of passenger, goods, and mineral trains which run at different speeds. With the increase in traffic, especially over the main arteries of our railways, it is necessary that some method of control should exist to ensure trains reaching their destinations with as little delay as possible. One of the means of doing this would be by increasing the number of tracks, but this is not always practicable, and moreover, in industrial areas it may entail a heavy capital outlay. An alternative adopted by the leading British railways is the *control system*, and a brief outline of the system of *central control*, recently installed in the North-Eastern area of the London and North-Eastern Railway, may prove of interest.

The controlled area is that portion of the main line extending from Shaftholme Junction near Doncaster to Newcastle Central. Over this line there is a very heavy volume of both passenger and freight traffic, and comparatively few running independents, or relief sidings, exist, and only over a very small length is the track duplicated. Under such circumstances, with an increasing number of trains of all classes from the pick-up goods to the main-line express, it will be apparent that some system is necessary to regulate the running of trains.

The control board on the North-Eastern area line shows the position of each yard, station, signal box, siding, and independent within the controlled area, and is divided into three sections. Five endless belts made of copper thread and driven by electric-clock mechanism are fixed above the

board, and move from left to right for the " down " line, and five belts similarly operated move from left to right for the " up " line. These belts travel at different speeds to represent the speed of the different classes of trains running in the area, and are so regulated that a carrier, hung on the belt applicable to the speed of the train which it is supposed to represent, should, at any given time, be at the same point as the train itself. Circumstances arise, however, which do not always make the representation a true one—the train for some reason may not have been able to maintain its scheduled speed. Some corrective is necessary, and this is done by different points in the area reporting when the train passes them, and the carrier is, when necessary, adjusted. Should a carrier arrive at a given point before the train is reported by the signalman as having arrived, it is automatically stopped and remains there until the train is reported as having arrived or passed, when the carrier is at once released.

If a train is stopped by signals or from any other cause, the signalman at the point where the stoppage occurs at once communicates the fact to the control officer, and the carrier representing the train is removed from the belt and hung on a peg until the train departs, when it is replaced on the belt.

The carriers have fixed on them descriptive coloured tallies and give particulars of the train, i.e. working time-table number, description, and points of origin and termination.

The board also shows the main lines in the large yards, and as soon as the train gets its path on the main line the carrier is transferred to the moving belt applicable to the classification of the train. Thus the operator has a visual diagram showing the position of every train running in the section and can make arrangements for the shunting of freight trains for those of higher importance, which could not be done so effectively without such knowledge. Again, one of two trains approaching each other in opposite directions, and which may be change-over trains, i.e. trains where the crews are booked to change engines at given points to avoid the men working excessive hours, may be out of course, and the controller is in a position to alter the point of exchange and save delay.

It will be appreciated from what has been stated previously that the control is linked by telephone to all the principal signal boxes in the area, and signalmen are held responsible for reporting all cases when delay is caused to a train by signals, when a train is turned from or to the main line, and when unusual occurrences take place.

The signalmen at the train reporting places have also to report the passage of all trains, and through this information the controller is in a position to keep the boards properly carded; also by this means one is able to see at a glance the position on these important sections of the North-Eastern main line, as it were, minute by minute.

The controllers regulate the running of special freight trains into or through the control area—no " special " being arranged over this section of the line without their permission—by which means such trains are timed to

W.T.T. No. Train Engine. No. Class day 192

Stations.		Time.			Wagons.					Load on Departure.				Remarks.
		Booked.	Actual.	Minutes Late.		Goods.		Mineral.		Wagons.	Tonnage.			
						L.	E.	L.	E.		Max.	Actual.	% Actual to Max.	
}	D				Att.									
	A				Att.									
	D or P				Det.									
	A				Att.									
	D or P				Det.									
	A				Att.									
	D or P				Det.									
	A				Att.									
	D or P				Det.									

Fig. 10

reach the various points *en route* at suitable times for yard working, &c. It also enables the linking up of engine working and economizes power.

Records of the trains together with their loads are tabulated on cards, a specimen of which is shown in fig. 10, distinctive coloured cards being used for "Up" and "Down" trains.

From these a summary of the freight train working is prepared as in fig. 11:

LONDON AND NORTH-EASTERN RAILWAY (N.-E. AREA) MAIN LINE CONTROL

Summary of Up Freight Train Working .....19..
Summary of Down Train Freight Working.....19..

W.T.T. No.	Train.	Departure from.				Arrival at.			
		Booked.		Actual.	Mins. Late.	Booked.		Actual.	Mins. Late.
		Station.	Time.			Station.	Time.		

Fig. 11

The compilation of these returns enables the working of freight trains to be carefully watched both in regard to punctuality and in regard to loading.

The control regulates the working of passenger as well as freight trains.

Use of Electricity as a means of Locomotion.—The subject of train working would be incomplete without reference to the advantages and disadvantages of the electric locomotive as against the steam locomotive. So far as the railways in this country are concerned, electricity has only been introduced to a limited extent chiefly on busy suburban lines. The only freight line of any dimensions where electric power has been introduced is on the Shildon and Middlesborough section of the North-Eastern area of the London and North-Eastern Railway, although the question of further electrification has been contemplated. The experience, therefore, for judging the results of electric power for working freight trains is only meagre, but there can be no doubt that there are distinct advantages in its favour as against the steam locomotive, and it is proposed to enumerate these.

A steam locomotive requires a considerable amount of time in preparing it and at the end of the day's work in putting away. Anything from two to three hours has to be spent in lighting up and raising the necessary steam pressure. The electric locomotive has a distinct advantage, inasmuch as it is ready for work at a moment's notice. The steam locomotive is out of action

regularly for varying periods so that the boiler can be washed out. With the electric locomotive this unproductive time does not obtain. In fact when one crew has finished its day's work with it, another can step on and commence work immediately without any loss of time. Consequently a much better locomotive " user " is obtainable with the electric locomotive, which means, of course, fewer locomotives with its accompanying benefits of reduced capital and maintenance charges and less housing accommodation.

There are many grades necessary to keep a steam locomotive in proper working order, such as boiler-washers, tube-cleaners, &c., who are not required with electric locomotives, and such equipment as water columns, turntables, ashpits, ash-wagons, washing-out plants, lighting-up furnaces and fuel for same are dispensed with.

It is also contended that the repairs and maintenance of electric locomotives are considerably less than steam; figures have been quoted to show the cost per mile of maintenance and repairs to be three times as costly for steam as compared with electric (*Modern Transport*, 24th December, 1921), and anything approaching this difference would result in a very large saving in the repair bills of the companies.

The electric locomotive also holds the advantage when at work, as the steam locomotive even when standing or running with steam shut off is still consuming fuel, and in addition incurs wear and tear on the firebox and tubes. With the electric locomotive there is none of this waste, as the electricity is entirely cut off. The steam locomotive incurs a not inconsiderable waste of time in taking water, fire cleaning, and turning. These have no counterpart with the electric locomotive.

There is also the further advantage which the electric locomotive enjoys, but which perhaps is of more importance on busy suburban passenger lines, and that is it has much quicker acceleration and gains the required speed much sooner. When a steam locomotive has gained the required speed, this has to be maintained. The fireman must keep up the necessary pressure of steam and maintain the boiler with the proper amount of water; if he fails, speed and time will be lost. The driver must work the locomotive with judgment or he may nullify the efforts of the fireman to keep the steam at the necessary pressure, with resultant loss of speed and time. An electric locomotive depends less on the human element. The pressure and volume of current is always there, independent of the crew working the engine.

It is very probable that with an electric locomotive getting its train into speed more quickly, and maintaining this in the case of through freight trains, an average speed of 30 miles per hour could be obtained. This would to some extent reduce the shunting of freight trains for slow passenger trains to pass, which would enable economies to be made in working costs and in the number of locomotives necessary to work a given amount of traffic.

The foregoing remarks deal only with what may be termed the " credit " side of the electric locomotive, but there is a very important item on the

" debit " side, and that is the cost of conductors for the power. Whether this be " third rail " or " overhead wire " its installation and maintenance are heavy, especially in the case of the latter. Both systems have drawbacks; the " third rail " would be a danger to the shunting staff in busy yards, and the posts and auxiliary gear for supplying the " overhead wire " tend to obscure the driver's view of signals.

Whilst these difficulties are real they are not insurmountable, and there can be no doubt that in time electricity will play a much greater part in the transportation of both passenger and freight traffic on British railways.

CHAPTER VI

Goods Shunting

The shunting of wagons is an important item of cost, as will be realized when it is stated that the shunting engine-hours incurred by the railways in Great Britain amount to approximately two millions per month, which calculated at 10*s*. per hour represents an outgoing of £1,000,000.

The charging of traffic is, generally speaking, based on mileage, and the service of shunting is, in a sense, non-contributory and should be kept at a minimum. In transportation by rail shunting is inevitable, and at all traffic centres, large goods termini, marshalling yards, and distributing areas suitable engines are exclusively employed for the purpose. At the smaller yards and station sidings the service is generally performed by the train engines. It has been shown in the previous chapter how some of the shunting may be avoided by instituting some sort of order in the way in which wagons are loaded in the open yard with traffic brought in and loaded by the public, as apart from that loaded by railway companies' staff. This can be further lessened in goods sheds, especially at large centres, by arranging the loading berths inside the shed in accordance with the order in which they are required for the making up of the various trains. These loading berths should be so arranged that the wagons as loaded are already marshalled in train order, thus avoiding the necessity for any further sorting in the yards. With trains made up in many cases from twenty to fifty wagons it is not, of course, possible to draw wagons from sheds without making a shunt; but as most modern goods sheds have loading runs holding from eight to sixteen wagons, it can be seen that by this form of classification some of the shunting will be obviated, and the difference between a prearranged method of loading as against indiscriminate loading will be appreciated.

Shunting Statistics.—Some method of check should be kept on this expensive part of the transport system, and the object should be to get the maximum amount of work done whilst the engines are available. The truest measure in this respect is the total number of wagons (loaded and empty) dealt with per engine-hour, and this is the fairest unit upon which

to criticize the achievements of the operating officer, as he has no control over any variations in the rates of pay of the engine crews or the cost of locomotive coal, so that to judge his supervision on the basis of actual cost per wagon would be fallacious.

The number of wagons dealt with per engine-hour will vary at different centres owing to a variety of causes—the layout of the lines, the length of shunts, and the method of shunting, as, for example, flat or gravitation, may make comparisons of one yard with another useless. Like must be compared with like. If, however, it is seen that the number of wagons dealt with per engine-hour in a yard for a particular period shows a falling off as compared with a previous period, and provided both periods are normal, inquiry is justified.

What has been said with regard to locomotive time applies with equal force in regard to the shunting staff. The following form (fig. 12) illustrates how the details could be shown to indicate improvement or otherwise in the shunting of wagons.

Reference has been made to gravitation shunting. The object of instituting this method of shunting was to economize engine power in the sorting of wagons, the wagons as they descend the incline being switched into selective roads. Where the contour of the land does not provide natural inclines, artificial humps are made, the wagons being propelled to the crest. This method of shunting requires less engine power than flat shunting, but, on the other hand, a larger ground staff is required to deal with the wagons. The general opinion is that the system is much more economical than the ordinary method of flat shunting.

The flow of traffic varies during different periods of the day, and consequently there are periods when shunting engines will be fully employed and others when they will be standing idle. A certain amount of standing time is inevitable, but some of it may be avoided, as the following instance shows.

At a certain station the average time per wagon was not considered satisfactory, bearing in mind the results at other stations, and the fact that the yard was well adapted to expeditious shunting. Inspectors were put on to watch the work, but failed to recommend any great change likely to improve the result. Personal visits elicited the fact that a great part of the time of the shunting engine was occupied in standing idle whilst other trains were in the yard at work attaching and detaching during the day. In other words, a shunting engine was booked out for twelve or fourteen hours, but only did about eight hours' work. To cure this meant a complete revision, and instead of the work being done between 8 a.m. and 6 p.m., it was fixed to be done after 5 p.m. to avoid standing whilst train engines were attaching or detaching. The station staff were aghast at such a suggestion—it would not work, the engine could not possibly do it, there would be all sorts of complaints, and so on. However, the change had to be made, and resulted in a saving of 20 per cent in engine time; whilst the station staff soon recognized the virtue of the innovation.

Month of.....192 192

Yard.	Year.	Number of Trains entering.	Number of Wagons detached	Shunting Engine-hours.			Number of Wagons detached per Engine-hour.	Wages paid to Yard Staff.	Yard Wages per Wagon detached.	Hours on Duty of Shunting Staff.	Wagons detached per Hour on Duty of Shunting Staff.
				Train.	Pilot.	Total.		£	d.		

Fig. 12

A knowledge of the time engines are in motion, and the time standing idle, should assist in the arrangements of the engine working if such is necessary. To ascertain this information by ordinary methods would involve considerable labour, but an instrument known as the " Servis " recorder has been placed on the market which claims to record the time when vehicles are moving and when they are standing. This instrument has been experimented with on shunting engines with a certain amount of success.

CHAPTER VII

Accounts: their Compilation and Collection

To write a textbook on the question of railway goods accounts would require a great many more pages than it is here possible to devote to the subject. It remains, therefore, to take a broad survey of the question, in the belief that the enunciation of the principles underlying the methods by which the accounts of the goods department are prepared and rendered, together with the main details of the various systems, will be found to be of service.

It is clear that with a huge sundry business such as the railways of Great Britain and Northern Ireland have to conduct, and the enormous number of small items involved in the account-keeping, the first essential to success is a thorough system of check. This system of check has many stages, commencing with the check imposed by the accounts clerk upon the invoicing and delivery clerks, followed by tests by the station agent of the work of the accounts clerks, and by the comparisons and checks of the audit department and the Clearing House.

Station Accounts.—Each station is responsible for a true and correct rendering of the amounts which constitute its " debit ", and subsequently, as a natural consequence, for obtaining the necessary " credits ". Broadly, the debit is of two kinds, the one being the " regular " debit and the other the " special " debit.

The regular or ordinary debit of a station consists of the " carriage-paid " items on traffic forwarded from a station and the " carriage-to-pay " items on traffic received by a station from some other station, as the amount chargeable for the services rendered to sender (for forwarded " paid " items) or consignee (for received " to-pay " items) at the rates applicable, either " collected ", " delivered ", " collected-and-delivered " rates or " station-to-station " rates. The " special " debits of a station are those chargeable for services rendered in addition to, or apart from, the services covered by the rate used, such as " rent for use of the company's warehouse or sidings "; " cartage beyond the prescribed boundary for free delivery "; " cartage of goods carried at ' station-to-station ' rates " " sack hire "; " weighing "; " demurrage " and such like.

The document providing the basis for the ordinary debit is the invoice. We have seen that this document is prepared in the invoicing office and that it accompanies the goods entered thereon to the destination. A copy is retained, and it is this upon which the accounts clerk works for his " forwarded paid " debit, whilst the original invoice provides the debit at the receiving station for " to-pay " items.

Necessity for Careful Invoicing.—Naturally, the more correctly the invoice entries are charged out the more will the accounting business be facilitated. It is a considerable benefit, when it is possible, to arrange for the accuracy of the rates used and the charges calculated to be checked in the invoice office *before* the invoices are dispatched to their destinations. This will not always be possible, but is strongly recommended when it can be accomplished. Once an invoice has been sent away before it is discovered that an excess or insufficient amount has been charged, such an error of " excess " or " deficiency " can only be corrected by the creation of an " overcharge " or an " undercharge " entry. If the error is discovered prior to the dispatch of the invoice, then it is quite a simple matter to make the necessary correction both on the invoice itself and on the copy of it.

The invoice having been issued, it is necessary to take measures to ensure the amounts entered thereon being brought to debit in due course and properly accounted for. No loophole must be left by which a servant of the company could be tempted to appropriate to his own use the amount due to the company. To meet this, each invoice bears a distinctive number, which is of assistance in checking the number of documents handed to the accounts clerk. At large stations each section of the invoicing office has its own series of numbers; whilst at the smaller places, one series of numbers is sufficient. The difference between the last number used on any one date and the last number of the previous date's working will give the total number of invoices to be accounted for on any one date. This is good, but in addition there is the system known as " abstracting ", which, in addition to other objects, serves the very useful one of providing a check which can be exercised by one station against another, and by the audit department against both.

Abstracts: their Use and Compilation.—As its name implies, the " abstract " is a statement abstracted from the invoices. In it are entered the totals of the " weight and charges " columns and the number and date of each invoice. The invoices are entered separately under the name of the station from or to which they are headed, i.e. all invoices from Manchester to Birmingham would be entered on the abstracts at Manchester under the name " to Birmingham " and at Birmingham under the name " from Manchester ". Thus, as will be easily seen, the sum of the invoices entered on the Manchester " forwarded " abstract under " Birmingham " should agree with the sum of the invoices entered on the Birmingham " received " abstract under Manchester, and, this being so, any omission at either station will prevent an agreement and bring the omission to light.

The items to the debit of the station are extended to the abstract extension, and the totals of the "porters" and "posted" and "overcharged" columns must be made to agree with the total of the "paid" and "undercharged" columns of the abstract at the forwarding station, and the "to pay" and "undercharged" columns of the receiving station. The sum of the extension columns again is balanced periodically with the porters and posted debit books, so that there is an absolute check ensuring that every item will be properly accounted for by the station responsible for obtaining the credit. Having assured this much, the way is open to check properly to see that all such amounts owing from the public are duly recovered.

Abstracts must be compiled in two main divisions, the first of which will contain entries of traffic made between the home station and other local stations, and the second to contain entries of traffic made between the "home" station and "foreign" stations. The first division is for traffic conveyed only over the railway on which the traffic originates, and the second is for traffic conveyed on the railway on which the traffic originates, or by which it is received and one or more other railway companies over whose system the traffic originates or travels, in order to complete its journey. Thus traffic from Derby (London Midland and Scottish) to Newcastle (London and North-Eastern) would be entered on the foreign abstract by the respective companies, but traffic from Newcastle-on-Tyne (London and North-Eastern) to York (London and North-Eastern) would be entered in the local abstract by the London and North-Eastern Company. The reason for this is apparent. The local entry concerns but one company —the foreign entry concerns two or more companies, each of which is entitled to a share in the receipts.

Why Double Abstracting is Necessary.—The question arises as to the necessity for a railway company to incur the expense of "abstracting" at both ends of the journey an entry of traffic carried entirely over its own system. Why should it not, it may be asked, be sufficient for the forwarding and receiving stations to abstract the to-pay entries only, leaving it to the agent at each station to look after the paid entries for the collection and crediting of which he is directly responsible? Why even take the trouble to invoice the charges for paid entries? This is a proposition which is very attractive, at first sight, particularly to those who are harassed by the exigencies of an early invoice dispatch. What an economy in invoicing if only the to-pay entries need to be charged out before dispatch of the invoice! Upon examination it will be found to have very little in it; the economy is more apparent than real. In the first place, it could only be applied to local traffic, as the Clearing House must have all foreign entries, so as to be able to apportion the receipts. Second, the "paid" and the "to-pay" entries on invoices are very largely intermixed, and it takes but a little time longer to abstract both; and third, but chiefly, it absolutely prevents any systematic dishonesty on the part of a forwarding station, which, in the absence of a complete abstract, it is easily conceivable, might indulge in the suppres-

sion of paid entries and the appropriation of the cash arising therefrom. Further, it would involve the establishment of a new system of check at the forwarding station at a probably greater cost, while the same record, or its equivalent, would be necessary to enable the requisite " balances " to be arrived at.

The Check Imposed by the Abstract.—The " abstract " is the key-stone of the accounts structure. By it the audit department is enabled to see that station "A" has rendered a true account of all its traffic, because its totals must agree with the totals of the traffic received from or sent to station "A" by all the other stations; by it the " debit " of station "A" can be balanced and proved to have been accounted for at station "A", while by its aid the compilation of the " traffic return " is easily conducted. Of course the accuracy of the abstract as a statement of the traffic is dependent upon the receipt in the abstract department of all invoices for " received " traffic and invoice copies for " forwarded " traffic. We have already stated that the system of numbering the forwarded invoices is of assistance in enabling a check to be kept upon them; and this applies in the same way to the registration of all received invoices. By carefully checking the received invoices passed to the abstracts with the invoices recorded on receipt, any invoices which have gone astray after receipt are quickly detected and either found or copies of them obtained. Still a further check is available. Traffic may get away without an invoice being issued for it, or an invoice may go astray before the goods reach their destination. In such cases the traffic is carefully noted as " received without invoice ", and steps are taken to obtain an invoice if one has not been issued, or a copy of the invoice if one has been issued. The system leaves no loophole for traffic to get through without being accounted for, except, of course, the human loophole of failure to carry out the system.

For convenience the abstract is subdivided as follows:

Goods
Mineral
Coal, coke, and lime
Live-stock.

The abstracts under each heading are summarized monthly, and documents known as *station abstract summaries* are rendered to the goods audit office, special summaries being prepared for local forwarded and foreign forwarded, local received and foreign received, the foreign summary being further divided between " heavy " and " light ", the line of demarcation being that where the net receipts for the month between a pair of stations in one direction by each route do not exceed 60*s*., the traffic is treated as " light ". This amount is liable to variation.

The local summaries are retained by the audit office for checking and accounts purposes, but the copies of the foreign summaries are sent to Railway Clearing House as a means of check and for the purposes of allocation of receipts.

Allocation of Debit.—It will have been noticed that there are columns at the right hand of the invoice headed " porters " and " posted " respectively. Broadly, the porters column is for all items owing from firms which are not allowed credit, and the posted column for firms which are allowed credit. Firms whose accounts are submitted monthly are known as " ledger firms ". The charges are extended into these columns at the station responsible for the clearance of the debit, and the figures are also entered into the corresponding columns on the abstracts. Taking the porters column first, broadly this includes all firms which are expected to pay currently, or at short intervals, such as a week or a fortnight; of course the conditions under which the charges for carriage are ascertained preclude them in most cases (empties traffic mainly excepted) from being collected at the time of receipt of traffic by the companies. The classification is so varied, and the rates on the books so numerous, that it is quite an impossibility for a carman or receiver to assess the charges on any consignment, even in those cases where the weight of the consignment is known to him. Traders, therefore, have credit in the case of traffic consigned " carriage paid ", until such times as the companies are able to render a statement of the charges, and in the case of traffic consigned " carriage to pay ", until such time as the traffic is delivered.

" Sundry Persons " or " Porters " Account Book.—The first desire of the companies, then, should be to place their accounts in the hands of the " debtors " at the earliest moment possible after the movement of the traffic. It is not always possible to do this the day following the receipt of the traffic by the companies, but fortunately it is usually the case; and it is most desirable that it should be so as often as possible. At present we are not concerned with the collection, but with the book-keeping. The items having been extended on the invoices to the porters column, the account (fig. 14, p. 245) is made out ready for presentation to the public, and the amount is taken to debit, that is, entered in the " sundry persons account " book with all other porters items for the stations' " forwarded " traffic. The total of the sundry persons account book must be balanced with the total of the porters column on the abstract extension sheet. Having accomplished this, there has been secured another stage in the system, for, as the abstracts must agree with the corresponding abstracts at the second station of each pair of stations, so must the total of the " S.P.A." book agree with the abstract; and, therefore, when we receive the credits to meet the debits in the S.P.A. book, we are assured that we have a check upon what cash is due to the company from persons not allowed credit accounts. At the conclusion of each month, any items for which payment has not been secured have to be transferred to the " porters outstanding book ". The total for the month (of this book), added to the total amount of cash received in settlement of porters items, will, of course, agree with the total of the porters debit as shown on the abstract extension sheets for the same month.

Simpler Method of Clearing Invoices.—There are short cuts, how-

DELIVERY SHEET

From..... .. . . .RAILWAY. *No.* . . . .

Checker..... *Date* .... *Carman* ... . *Van No.* . . . .

No. Sheets . ... *Date* .. .. *19* . . *Pro.* . . .. . .

Invoice No. and Sender.	Consignee and Residence.	No. of Articles.	Species of Goods and Marks.	Weight.	Rate.	Paid On.		To pay.
							Folio Reference:—	
					Cartage			
By whom Received					Total To pay			

INSTRUCTIONS TO LORRYMEN.—The .... Company's Lorrymen are hereby instructed that in future the charges upon all goods must be collected at the time of *tender* or delivery, and they are not allowed to leave goods unless the carriage is paid, except in cases where the Consignees have an authorized credit account with the Company. An exception may be made in the case of goods addressed "Paid" if the Consignee will give the label to the Lorryman, and supply sender's name and address, if this is not shown on the label. The Lorrymen are instructed to respectfully make known this regulation in all cases where the parties object to pay the carriage of the goods, pointing out this notice as an authority for bringing back the goods to the Station, but the Consignee must be told that a charge for the additional cartage will be made by the Company. Any error in the charge will be immediately adjusted upon application by Consignee to the Company's Station or to the District Goods Manager. The duty and responsibility of the Company will cease when the goods are unloaded from the Company's van or wagon, and placed at the door of the Consignee.

Should this Sheet be lost, anyone returning it to the above Station will be rewarded.

Fig. 13.—Specimen Delivery Sheet (see p. 224)

ACCOUNT FORM

.... RAILWAY. . . . . LONDON.

From .... DR. *to the* .. . . *Railway Company.* . ... *19* .....

Sender.	Consignee and Residence.	No. of Articles.	Species of Goods and Marks.	Weight.	Rate.	Paid On.	To be Paid by Sender.	To be Paid by Consignee.
					Cartage			
The Directors require the carriage to be paid on delivery, unless the Consignee has a Ledger Account with the Company.					Total To Pay			

Fig. 14.—Account Form

ever, which a busy agent or accountant finds very useful. He may dispense with the sundry persons account book, and clear his invoices direct to his cash book, for all items paid within the month agreeing with the date of invoice, and then transfer the uncleared invoice entries to the porters outstanding book; in this way the totals of the outstanding book and the cash book combined should agree with the abstract extension totals.

In dealing with traffic received for delivery at, or from, a station, the cash will, in the majority of cases, be collected at the time of delivery of the traffic, and this renders the second method very easy of application, as the debits—the invoice entries—and the credits—the cash-book entries—come together practically at an identical moment. The labour of making all the entries in the sundry persons account book is thereby avoided.

Another short cut which is quite safe applies principally to the forwarded traffic. In place of entering each individual item on the sundry persons account book the totals of the invoices only suffice, and a good deal of labour is avoided at places where the invoices contain many items. Great care is necessary to see that the items collected are credited to the proper entry in the S.P.A. book.

Goods Balance Sheet.—Another system adopted by some stations is for a full account to be kept of every consignment, full particulars of which are entered in a book, a specimen of which is shown in fig. 15. A separate record is kept for local forwarded, local received, foreign forwarded, and foreign received, goods traffic being also separately recorded from mineral. The particulars are entered daily. Such a record is of much value as it forms a full statement of the business of the station both as regards tonnage and charges, and shows at a glance how every debit has been cleared whether by cash, or recharge, &c. By reference to the invoice delivery-sheet or delivery-book, any discrepancies can be readily traced. The information being posted currently enables tonnage records or cash balances to be available at much shorter notice than could be done if the abstracts were the only means of doing so.

Ledger Accounts.—The greater portion of the debit, however, is posted to traders who have ledger accounts: for which special authority is required. The method of balancing is the same in principle as in the case of the porters, i.e. the total of the ledger accounts for any one month must agree with the total of the ledger or posted column on the abstract extension sheet, exclusive of any "special" debits that may be included in the ledger accounts. There is great diversity in the methods of compiling the ledger accounts, and this diversity of methods is found not only in different companies, but also among different stations of the same company. It may be useful to give four examples of the methods of compiling ledger accounts so that readers may select the one which in their opinion is best in principle or best meets their local requirements.

The first one to be considered is that by which the entries are posted direct from the invoice copies for "forward" traffic and the invoices for "received" traffic. Obviously this method lends itself most easily to a

GOODS BALANCE SHEET

Invoice No.	Station	Name	Reference	Weight						Paid on.			Paid			To Pay				Porters			Posted			Overgots			By Cash						C B Reference	By Recharges						P O B Reference	Overgot in Previous Accounts			Over-charges			Other Credits			Outs			Remarks
				Carted		Station to Station		Mineral																					Current			Outs				Current			Outs																
				Tons	Cwt	Tons	Cwt	Tons	Cwt	£	s	d	£	s	d	£	s	d		£	s	d	£	s	d	£	s	d	£	s	d	£	s	d		£	s	d	£	s	d		£	s	d	£	s	d	£	s	d	£	s	d	

Fig. 15.—Goods Balance Sheet

[Facing p. 2[illegible], Vol. I

" ready " balance with the abstract extension sheets, as there cannot well be items in the accounts which do not appear on the extension sheets, and vice versa, if proper care is taken of the invoice and invoice copies. The main objections to this system are, first, that if there are any consignments dispatched uninvoiced, those items are excluded from the account until such time as the omission has been rectified by the method of " unentered " reporting, unless the whole of the invoice entries are carefully checked over to the consignment notes and omissions rectified currently. If the invoices are not so compared with the consignment notes, then one is quite at the mercy of the " receiving " station. This means that, assuming that the receiving station does its duty currently, the entry in the ledger account will be made out of its proper date order, which is, to say the least, undesirable.

The second method is more costly, but in the writer's opinion preferable to the first. All the consignment notes of traffic from firms having ledger accounts are specially sorted in alphabetical order, according to the initial letter of the firm's style or name. The body of each entry is then made on the account from the information on the consignment note; and subsequently the invoice copies are brought in and the charges copied from them on to the account. The objection to this method is its expense, but the advantages are that all the entries on any one note are transferred to the account in the same order as they appear on the consignment note, which facilitates the traders' work in checking the accounts; second, any errors made in transcription from consignment note to invoice can be corrected before the account is issued, and any entries wrongly invoiced " to pay " instead of " paid ", can be corrected currently; third, any consignments sent away uninvoiced can be included (unless the consignment note has gone astray) under the proper date of the consignment. Of course the errors and omissions under the two latter heads have to be posted into the " no-debit " books to facilitate the balancing with the abstract extension totals. At large centres it is usual, under both these methods, to maintain " ledger-balance " books, wherein are entered the figures according to the abstract section in which they also appear, so that any errors can be readily located when balancing the accounts with the abstract extensions.

The third method is the use of consignment notes as the basis. Under this system the notes are numbered consecutively on arrival at the station, and recorded in a book. The rates and charges are entered on the consignment notes prior to the invoice entries being made, and the accounts are written up from the consignment notes as in the foregoing method, but with the difference that the charges are also copied from the consignment notes. A balance sheet is then made daily from the invoices and compared, entry by entry, with the details of the account. A rough abstract of the invoices is made and checked to the regular abstracts and to the balance sheets. This is a very complete method and has the distinct advantage that, provided a consignment note is received for every consignment, the

accounts must be *duly* posted in a complete form, each line of entry being written out completely in one operation.

Yet another method is to enter the detail, exclusive of charges, from the consignment notes into a book, and to add to the entries in the book the charges as entered on the invoices, clearing any discrepancies through a " discrepancy " book. The totals are transferred to a " balance " book, the totals of which are balanced with the abstract totals. The methods of posting ledger accounts have been dwelt upon at some length, as it is of great importance in the working of a goods-accounts office. Although unnecessary expense should be avoided, yet accuracy is a greater essential than economy. The use of typewriters is strongly recommended as a neatly typed account, with its clean and distinct copy, is necessary, if railway companies are to conduct their business on up-to-date methods.

So far only the " regular " items of debit have been dealt with, but there are many items under the heading of " special " debit which have to be provided for. These arise from extraneous charges, or charges outside those based upon the rate at which the traffic is charged. Some of these charges are enumerated at the commencement of this chapter, and there is no necessity to recapitulate them. What needs to be stated is the necessity for a thorough system of check to see that all such charges are raised when incurred and brought to debit. The items require to be entered on a special debit sheet or in a special debit book so as to arrive at the total amount of debit, and to regulate the proper clearance thereof.

" Paid-on " Charges.—A separate charges column will have been noted on the invoice forms headed " paid-on ". In the course of a carrier's business many transactions will arise which involve a paid-on charge, this being a charge already earned by a third party over and above what is due to be entered as a portion of the charge provided by the rate for transit from the invoicing station to the destination station; paid-on amounts are therefore amounts which have to be paid out to some other person or persons. It is necessary that these should be entered in a special book known as the " paid-on book ", so that the necessary clearances may be entered against each item. The paid-on book requires to be carefully and regularly entered up and cleared to prevent over-payment and to facilitate balancing at the end of the month.

Overcharges and Undercharges.—The multifarious nature of the railway business inevitably brings with it a percentage of error in charging, owing perhaps to a faulty description of the traffic, to an error in arriving at the weight of the goods, by applying the wrong rate, in calculating the charges, or by wrongly casting the invoicing columns. The work entailed in correcting the errors arising from these sources should undoubtedly be borne by the department mainly responsible for them, i.e. the invoicing department. The clerks of this department usually work at high pressure, and the temptation to rush the work to get rid of it is very great. If the clerks have to do the corrective portion of the work in addition to the initial portion, the obvious result is that greater care is taken with the

invoicing. The common methods of correcting overcharges are as follows.

The amount of overcharge is extended to the respective column on the invoice (see figs. 6 and 7, facing p. 220).

Overcharges of less than 2*s*. 6*d*. in amount are cleared by the issue of overcharge vouchers, whilst those of 2*s*. 6*d*. and over are, with certain exceptions, cleared by means of an overcharge invoice. It will be readily understood that reference to such invoices or sheets must be made on the original invoice and copy to prevent duplicate issue of overcharge documents. In some cases an overcharge may admit of dispute, and then agreement between the two stations interested is necessary to prevent labour being needlessly caused by issue of overcharge invoices. When dealing with an entry of traffic to or from a foreign station, it is necessary to get the overcharge certified by the foreign company before credit can be obtained from the Clearing House. Such arrangements as these are designed to prevent persons clearing difficult items by raising overcharges of disputed amounts, and many minor details of working are involved into which there is not space to enter here. Undercharges on " received to pay " or " forwarded paid " items are debited by the issue of " paid " invoices, and in the case of an undercharge being debited in a " received paid " or " forwarded to pay " entry, the other terminal station is instructed to issue the paid invoice.

This is the main outline of the manner in which the various items of the debit are composed. Having created the debits, it is necessary to see that proper arrangements exist for the collection of the various amounts from the debtors. It has already been seen that two main divisions of the debit exist, i.e. porters and ledgers. In the case of the porters items on traffic received for delivery, the collection of the amounts devolves upon the person making the delivery, in the majority of cases this being the carman.

Collection of Charges by Carmen.—No one will deny the wisdom of removing temptation as far from any man as is possible. To save carmen from the temptation to misappropriate to their own use any of the cash which they are required to collect on their employers' behalf, the rules regulating their work in this direction must be strictly carried out. Quite the best method in use for achieving this—and it is one which works admirably—is that now described. When the delivery sheets for the traffic to be delivered are handed to the carman, a copy of each sheet (having been made in duplicate) is retained by the accounts clerk. The number of the sheets handed over is recorded on the carman's docket, and this enables the man to check the record set up against him. The sheet copies are kept in numerical order, according to the rotation in which the sheets have been handed to the men. During the absence of the men the details of all entries—together with the cash they are required to collect—are recorded in the cash book under the carman's name and sheet progressive number. When a carman returns to the station he must produce the sheets and the money, or, if he has been diverted elsewhere during the daytime, the certificate of an authorized officer showing that the sheets have been accounted for at the station or office to which the carman was

diverted from his home station. Strict and prompt action is taken in respect of delivery sheets reported as " lost " or " missing ", so that the men know that they have no loophole by which payment of moneys collected can be delayed or avoided. The typewritten delivery sheets, with their clearly printed figures, are a great boon to the men in the collection of the charges.

Other porters items are usually passed to the collector, against whom a debit is set up, each item remaining open until the necessary credit or rejection of payment is to hand.

Collection of Ledger Accounts.—Ledger accounts are usually dispatched to the debtors through the post, payment being usually made in a similar manner, although all companies employ collectors who wait upon traders if necessary. It is scarcely necessary to state that persons deputed to collect accounts must be a body of men distinct from those who have the compilation of the accounts.

Unfortunately for the railway companies the accounts are not always settled in full or promptly, and " outstanding " books and " disputed-charges " sheets are in daily use. On these sheets provision is made for the clearances to be shown in the column for the month when the clearance is obtained. A full record of the number of items in hand of two months or less, over two and less than six, and of six months' age and upwards, is strongly recommended to be kept, so that it can always be easily ascertained how many items of different ages are still outstanding, and whether the older items, which presumably present the greater difficulties to a clearance, are being sacrificed so as to enable the easier items to be cleared up, and thus show a low number in the aggregate. So long as clerks have to show how their work stands—and this is considered very necessary—so long will they try and clear off easy items at the expense of the difficult ones; but a subdivision as suggested here effectually prevents any such " cooking ".

The Revenue Statement and Balance Sheet.—The directors and shareholders naturally want to know frequently the position and prospects of their business, and to this end the traffic returns are published weekly, showing the increases or decreases compared with the corresponding period of the previous year. The " abstract " system provides a ready means for obtaining the information necessary to enable the head-quarters staff to publish the statistics required.

It is very necessary to record in proper form a full statement of the debits and credits, showing the position of each at the various stations. This is usually done once a month. The debit side is principally made up as follows:

(*a*) The balance carried forward from the previous balance sheet.

(*b*) Total debit on traffic received and forwarded during the month.

(*c*) Amounts transferred to debit.

(*d*) Special debits.

(*e*) Amount transferred to next month's credit, such as undercharges not invoiced, paid-on's " not paid ", and amounts without debit.

Whilst on the credit side there is shown—

(*a*) Cash collected during the month.

(*b*) Credit notes for cash.

(*c*) Amount transferred from last month's debit side.

(*d*) Transfers credited.

(*e*) Sundries.

(*f*) Balance transferred to next month, such as uncertified overcharges and boatages, outstandings, and balance of cash book.

CHAPTER VIII

Working Statistics

Many persons, including some who might be expected to think otherwise, like to deprecate the use of statistics. Other persons, in their zeal for statistics, run to the other extreme and overrate the value of figures. There can be no doubt, however, that very good service can be obtained from a careful and intelligent use of figures, but figures should always be kept as servants.

Reference has been made as we have gone along to the statistical records which should be kept to see that efficient and economical working obtains in the handling of traffic, the loading of wagons, shunting, and the loading of trains, and the form in which such information could be prepared. To attempt the working of a railway without an adequate system of statistics is to attempt to work in the dark. The returns to be of real value should be compiled regularly, as it is invariably found that spasmodic attempts at statistical records will be rendered worthless, because some of the details will probably be missing at the time they are required. Furthermore, returns which are regularly compiled do not disorganize the clerical working to the same extent as special inquiries, and above all, a permanent and consecutive record of statistics prevents one from drawing misleading results which cannot always be obviated when the statistics are for only a limited period.

Until recent years, railway companies did not compile statistics on any uniform basis, each company preparing those which it considered necessary. There was, however, certain statistical data on uniform lines embodied in the published accounts of each company, but these figures were not of much service to the traffic officers as they were too limited in detail. The Railway Accounts and Returns Act, 1911, made it incumbent upon all companies to publish statistics in greater detail, but still they fell a long way short of being of real practical use from an operating point of view.

It was not until the Ministry of Transport Act of 1919 became operative that any comprehensive statistics were prepared for all companies on a uniform basis. By the Railway Act of 1921 every company is required

to render to the Ministry of Transport regular statistical information embracing all the principal sections of railway working.

The statistical information rendered to the Ministry of Transport is circulated monthly as a Government White Paper, and is on sale to the general public.

The grouping of railways, together with the very large areas now embraced by each group, has greatly increased the necessity for regular comprehensive statistics, which in the case of the general manager and chief officers should, generally speaking, be rendered monthly, giving also comparative figures for the corresponding period of the previous year, and thus enabling any abnormal results to be observed. The district officers may require information from the stations more frequently, but it is very essential that definite rules be laid down for the compilation of the various returns, together with the date on which they are to be completed, as statistics to be of practical use must be accurate, and available at an early date after the period to which they refer.

It is necessary that at large stations periodical and full statistics should be maintained, as the information required for the purposes of the head and district officers usually necessitates daily records being kept at the stations, thus enabling the latter to watch the various results day by day. Mention has previously been made of the following three items, which together with clerkage constitute the principal expenditure at a goods station:

1. Shunting.
2. Handling in sheds or warehouses.
3. Cartage.

Goods agents and others concerned should watch the results obtained day by day, and thus be in a position to effect any economies in staff which the circumstances justify. They are also then in a position to furnish readily any explanations which may be called for in regard to the results revealed by the statistics supplied to the officers. A good many needless inquiries would be obviated if agents would, at the time of rendering the returns, furnish an explanation of any abnormal circumstances which have affected the results, and this could readily be done if the daily figures are carefully scrutinized.

The cost of clerical staff is more or less stable, but periodical tests should be taken showing the number and cost of staff for each of the principal stations, together with the units of work done. The latter is most readily measured by the number of consignments.

Charts.—The use of charts as appendices to the ordinary form of statistics is not sufficiently appreciated. The chief value of statistical charts lies in their ready representation of the figures from which they are constructed. A properly drawn chart presents to the eye immediately what can only be gathered from rows of figures after an exhaustive study.

Generally speaking, daily and weekly representation by charts would not be of much use, for the reason that the fluctuations may be violent and

rapid from time to time without any easily assignable cause, but in long periods such differences would tend to equalize one another, so that the representation of aggregated figures at fairly wide intervals, monthly and quarterly, affords a much more steady indication of the trend, and proves of great assistance in those periodical reviews of working and expenses which it is necessary to make from time to time. Charts are particularly valuable in that they provide a continuous retrospect of the results, in contrast to the ordinary comparison of any one period with its corresponding period in the previous year, ignoring, as the latter does, any radical changes which may have taken place in the interim. Charts should have two or three lines when necessary; for instance, tonnage should be shown as "gross", "forwarded" and "received", thus bringing out the relations of one to the other in the clearest form possible.

Another great advantage to be credited to the use of charts is that a much longer period can be shown in a much smaller space than is possible when the actual figures are recorded. It is usually futile to compare the statistics of one station with those of another, as different combinations of circumstances, which are inevitable, produce different results; but, whilst admitting this, comparisons may be of service in drawing out points of efficiency and economy which are reached at one place, and can by an adaptation of method be reached at others.

The large increase in the quantity of statistical information now compiled by British railways has led to the adoption of special statistical sections. Where the area covered is not too large, a central statistical department is probably conducive to the greater efficiency, but with the grouping it may be found necessary to sectionize the work.

CHAPTER IX

Correspondence

The vast quantity of miscellaneous traffic that is handled—one company (pre-amalgamation) handled nearly seven million consignments annually in London alone—of necessity brings with it a great volume of correspondence. The correspondence can usually be taken as the key to the working of a station, and it is therefore very useful to keep a carefully compiled record of the volume of correspondence, and to compare it periodically with the volume of traffic. The flaw in any such record is that when other stations are working badly, the correspondence with those stations will be much increased, and this will somewhat interfere with the comparison of traffic and correspondence at one's own station, which may be working well. This flaw, however, is seldom likely to prove a very serious one. One will ask how the correspondence may be compared with the traffic? In nine cases out of ten a correspondence will originate in connection with

some one consignment, not with a series, or multiplication, of consignments on one hand or single packages or portions of consignments on the other. Now both a correspondence item and a consignment are tangible units, and the number of correspondence items originated (by whom does not matter) compared with the number of consignments handled forms a practical basis of comparison. The percentage that the former bears to the latter is a concise and ready index finger to the state of the work at a station. It is an easy matter to get at the figures; each new correspondence item is given a number to facilitate reference and filing, and the sum of these numbers for a given period, week, month, or quarter, should be recorded; the number of consignments can be taken easily by counting daily the number of consignments invoiced forward, and by adding the number proved to have been sent away without an entry, and, on the received side, recording the number of consignments entered on the invoices; this being most readily done at the time when the invoices themselves are recorded. Where the volume of traffic is sufficiently great, it is well to record the forwarded correspondence and consignments separately from the received correspondence and consignments; but usually it will suffice to lump the whole together. Stations which have a large amount of transhipping to do should be permitted to include the number of transhipping consignments in their figures, as correspondence arises on transhipping consignments, although it is not in the same proportion as on ordinary forwarded or delivered consignments.

Correspondence Offices.—A good deal of difference of opinion is held with respect to the conduct of correspondence of large stations. Some experts favour the establishment of separate correspondence offices, which shall exercise a check over the working—invoice and delivery—offices, whilst others favour the division of the correspondence amongst the staffs of those offices. There is something to be said for both views, but in our opinion the best method is the *via media*, namely, a central correspondence office in which inquiries for goods, instructions from managers and head-quarters, complaints from the public and claims for goods lost, damaged, &c., are dealt with, leaving the discrepancies in working—as revealed by reports of goods not to hand at destination, or goods received without invoice, or goods refused on account of erroneous charges for carriage, cartage, &c., being made, or other cause, together with undercharged or overcharged items, and recharges in consequence of differences between labels and invoice entries—to be dealt with by the invoicing and delivery offices, as they are more nearly concerned with such discrepancies.

The principle of such an arrangement is that the correction of errors is placed on the shoulders of those who made them, or failed to correct them. This serves a double purpose. First, it acts as an inducement to the staff to avoid errors, as only thereby can they economize their labour; and second, it acts as a corrective, as by the revelation of the errors the staff improve their knowledge and learn to avoid errors of a similar nature, and it is reasonable to suppose that they will more readily learn

to improve by this method than were they only required to " note " communications from a detached " correspondence " department. The correspondence office will be left free to give prompt attention to the public, and to apply remedies to any defects in the general working which will be revealed to it from time to time through its work. One may be met with the objection that not all the correspondence which would be dealt with in the invoice and delivery offices arises from errors made in those offices. Quite so, but it will include all errors that are; and the clerks of these offices will, or should, be more expert in laying bare the others that are due to faults elsewhere.

Correspondence Statistics.—A first law of correspondence is that it must be done currently; no item of correspondence improves in its chances of a satisfactory ending by being left over from day to day. Once allow the correspondence to get into arrear and the quality of the work immediately depreciates. An easy and effective check on this is attainable by statistics of the following order: A record book should be kept in each office, and in this book should be entered each week, for each division of the work separately, the number of items which were outstanding at the close of the previous week's work, the number of new items enrolled during the week, the number of items filed for the first time, and the number not disposed of. By prohibiting the recording of a matter when filed a second or third time (this repeated filing is occasionally necessary owing to various circumstances) two things are accomplished: First, it is always possible to balance columns one and two (number brought forward and enrolled) against columns three and four (number filed and carried forward) and to prevent an unscrupulous clerk from inflating his filed numbers by prematurely filing matters in order, at the same time, to decrease the number which he should legitimately show as not disposed of.

Another problem that vexes agents is whether one correspondence matter should be dealt with by two or more persons at one station. At the smaller-sized stations, of course, this question never arises, as obviously one man will be better able to conduct the inquiry into a matter with economy, but at the medium-sized and large stations the circumstances are different. At a small station the whole thing is more easily comprehended than at the larger stations, consequently a newcomer picks up all the threads with comparative ease. At the larger stations it necessarily takes a newcomer a longer time to become thoroughly acquainted with the ropes, and if it is left to the individual to make most of his own discoveries, he will be a longer time becoming proficient. A common practice to meet this is that of employing assistant correspondence clerks who are known as " referencers ", i.e. those who refer to the documents necessary to enable a matter to be dealt with. By this work of referencing, the juniors gradually become educated in the system of station working. This is not the best solution, and the following method (which may be in use at places, although we are not aware that such is the case) commends itself as producing the best and most economical results, provided that provision is made for the fuller

education of the juniors. This method is that in which the work of referencing is done by the senior clerks, each clerk taking a definite section of the work, which should be sectionized so as to meet local requirements. The senior clerks should not spend time in writing letters, but there should be a special set of junior clerks set apart for the sole purpose of writing letters, registering the new subjects as received, and filing and attaching papers and replies. The junior clerks should be shorthand writers and typists, and the replies to inquiries should be dictated to them. By this means the clerks with the greater experience and intelligence would be employed in " bottoming " matters, so avoiding prolonged and duplicate inquiries, whilst the younger members of the staff would get a wider knowledge by reason of their coming into contact with a greater mass of subjects.

Filing Documents.—Whilst dealing with this branch of the work, reference to the custody of documents will not be out of place; but, to avoid wearying the reader with detail, it will be sufficient if reference is made to the preservation of consignment notes, invoices, copies of invoices, and delivery sheets. It is a first essential, if correspondence and kindred work is to be efficiently conducted, that the documents named shall be stored in such manner as to render them perfectly easy of access for reference. A light and airy room should be set apart for their storage. All consignment notes should be, at large stations, pasted on backs and made up into bundles, each day's notes separate; at smaller stations they should be placed in small cardboard boxes. The notes should be arranged alphabetically, according to name of destination station, so that in dealing with all inquiries it is sufficient to know the name of destination station.

The invoice copies should be pasted together by being doubled inwardly, so that the back of the left-hand half of copy No. 2 can be pasted on the back of the right-hand half of No. 1, No. 3 on No. 2, and so on, until the copies constitute a book. The received invoices should be treated in the same way, where possible, or otherwise pasted into skeleton guards. Both should be in station order, as giving greater facilities for referencing.

The delivery sheets should be pasted into guard books in numerical order, or tightly clipped together. Experience proves beyond a doubt that well-preserved documents materially assist the conduct of the correspondence at stations.

CHAPTER X

Claims

The payment of claims is, and always must be, a very unsatisfactory feature of the railway business, and this for three reasons: First, that a payment of this kind is not only a loss in itself, but is also a cost, in that men are employed to deal with the claims: second, because claims are

always more or less a reflection or slur upon the efficient working of a company's business; and third, because it provides a temptation to a company's officials to buy traffic. It follows, consequently, that a railway company which is desirous, and all companies should be equally so, of keeping its claims payments down to a minimum, has three broad principles upon which to proceed, which are closely allied to the three reasons just mentioned.

The Claims Staff.—To take the principles, then, in the same order as the reasons: the first principle is that members of the staff employed in the investigation of claims made by the public must be trained to be, and expected to become, experts in their branch of the work. By this it is not necessarily meant that a man once made a claims clerk should by that fact be expected to always remain a claims clerk. Such a condition might conceivably, in individual cases, inflict hardship on a man who would be thoroughly deserving of promotion to higher posts, but with this exception the claims staff should be immovable, and as such should be enabled to look for reward in a scale of sufficient remuneration for its services in its own special department. Second, the inquiries into the claims made and the causes which have brought them about should be so intelligently conducted that the weaknesses in the outdoor working which are bound to be discovered from time to time should be laid bare, and steps promptly taken to commence the healing process at the earliest moment by applying the necessary remedies. It is necessary to go a step farther than this, however, and see that a remedy, once applied, is continued until the evil is corrected, and, after that, to impose occasional tests to see that the improvement, once effected, is maintained. Third, members of the staff engaged in soliciting traffic should not be allowed to decide what is to be the maximum payment in settlement of a claim, even if they are allowed to have a hand in the settlement of claims at all. They must, indubitably, be at a disadvantage if at the same time that they are soliciting traffic for their company they are refusing to pay to the person from whom the traffic is being solicited what that person, wrongly perhaps, considers to be the amount to which he is entitled.

Methods of Dealing with Claims.—Practice varies considerably in the mode of dealing with claims papers. In some places the whole of the claims work for a given area is centralized in one office, and "referencers" are sent from this office to make inquiries into the matters and report the facts of each case to the claims clerks. In other places the claims papers are passed from the claims office to the agent in charge of a station, who deputes a clerk on his staff to investigate all claims matters and to report the result to the claims office, taking steps personally to deal with all irregularities that demand his attention. Yet another arrangement is that by which the station agents not only investigate and deal with the claims received, but also decide the amount for which each claim, up to a given amount, is to be settled. It is suggested that an arrangement on the following lines is more likely to promote efficiency in working the traffic

and a proper regulation of the payments in settlement of claims. This plan proposes that all claims should be passed immediately upon receipt to the central claims office in each district or area of the line controlled by the district manager, superintendent, or divisional officer. On arrival in the claims office each claim should be taken by the registrar and entered in the claims register under the initial letter of the claimant's surname, or the initial letter of the main word in the title of the firm on whose behalf the claim is made, so that all A's will be entered in one place, B's in another, and so on. This renders it particularly easy to assess at any time the number of claims arising on any one firm's traffic. Other details to be recorded in the claims register should be date of claim, date received, date on which traffic passed; points between which traffic was carried, cause of claim, amount of claim, amount paid, whether claim is declined. The " cause of claim " section should be divided into the following columns:

Total loss.
Partial loss.
Pilferage or theft.
Breakage, chafing, or other damage (except by wet and fire).
Damage by wet.
Damage by fire.
Cattle.
Accidents in streets and personal injuries.
Delay.
Other causes.

The registration accomplished, the papers should be specially passed to the station at which the traffic was handled, and, to ensure prompt return of the papers from the stations, the registered number of the claim and the date on which the papers are passed to a station for attention should be recorded, a book being set apart for this purpose, and the papers for each station recorded in a section of the book—each section being devoted to one station. On the return of the papers, the date of return ought to be entered, so that a glance at the book at any time will reveal the number of cases under inquiry at any one station.

Agents and Claims Experts.—The station agents should investigate and report upon the facts of each case, and here perhaps it may be necessary to urge agents to see that this work is done, not with the intention of covering up as much as possible that may reflect upon the working of their station, but so as to place the fullest information possible in the hands of those whose duty it will be to adjudicate upon the claim. The agents will, for the benefit of their own working, take steps to see that recurrent irregularities which are avoidable will be so recorded that their attention will inevitably be drawn to them, and that they, the agents, will be able to see what weaknesses there are that require to be remedied.

It will probably be necessary to communicate with the station, away from the district or area in which the claim has been made, to which the traffic in dispute was forwarded or from which it was received. As it is

important that the fullest information be obtained, it is decidedly a good thing to make the inquiry on a printed form, on which are set out the points requiring to be dealt with, so that no person can reasonably fail to give all the necessary information. This form should be issued by the station to which the papers are sent for investigation.

So far, then, we have guaranteed that the work of investigation of the facts shall be conducted by those who are expected to be fully conversant with the detail of the station working, and, this having been accomplished, the papers with the necessary reports are returned to the claims office. All that remains to be done is for the expert—and under this scheme none but experts need be employed in the claims department—to adjudicate as to the liability and indebtedness of the company to the claimants. Most railway companies now have schemes for the education of their staff in railway subjects, and railway law is one of the subjects usually included in the curriculum, and there can be no doubt that such schemes must be of mutual value both to the staff and the railway companies, as, for example, in this particular section of railway work a claims clerk needs to be thoroughly conversant with: (1) the various Acts of Parliament relating to the liabilities of carriers in respect of goods handed to them for conveyance, particularly those known as the "Carriers Act" and the "Railway and Canal Traffic Act, 1854", and (2) the textbooks dealing with the subject, such as Disney's *Law of Carriage*.

Checks on Claims Payments.—The liability of the company having been determined, the papers should be marked with the amount to which the company is prepared to go—in settlement of the claimant's demand. This stage reached, the papers should be passed to the senior claims clerk or other responsible men appointed to assist him in the work, and the whole of each case scrutinized and criticized before payment of any amount is finally authorized. This arrangement provides a check upon the work of the less-experienced clerks, and not only prevents improper settlements, but also provides a means of educating the juniors in the claims department. Needless to say, payments must only be made by persons authorized to attend to this work; these persons should not be interested in obtaining or retaining traffic, but should be of sufficient intelligence and experience to enable them to be able to discuss matters with the claimants, and to obtain the best possible terms for the company.

It is absolutely essential that a proper receipt be obtained for all payments, and, whether payment is made by hand or through the post, a receipt form should be handed to the claimant to be filled up by him. All such receipts should be perused and initialled by the chief claims clerk, and carefully filed for reference after the amounts have been posted in the claims ledger, the reference to which should be clearly shown on the claims voucher.

Goods Lost.—It will have been noticed that in the claims register there are provided three distinct divisions of this heading, namely, goods totally lost, goods partially lost, goods pilfered or stolen. By the first is

meant the total disappearance of a consignment or package. It may be argued by some that this is very much akin to the third division—stolen. Nothing, however, can be put down as stolen that is not proved to have been stolen; until this is done it must be regarded simply as a total loss.

Total losses arise principally from three causes, namely (1) bad checking, (2) wrong sending, (3) by the goods being without address or mark. It is not proposed to re-traverse the ground covered in the chapters devoted to the handling of the traffic, but it will not be out of place to note here that what checking is considered necessary should be well and efficiently carried out; and that to ensure this it is absolutely necessary that all failures in checking should, where possible, be traced home to the party at fault and the neglect dealt with, care being taken to see that any weakness which may be revealed in the system is promptly corrected. Wrong sending may be due to the fault of the man who loads the wagon, but should be detected by the checker.

The ordinary means of correcting errors arising from these causes is by the issue of reports to the sending station; the station receiving the goods without entry will send a report to that effect to the sending station, and the station having an entry and being short of the goods will so report the fact to the station which issued the entry. It is an excellent plan to supplement this system of reports by the establishment of a central office, to which at, say, the end of a week, all errors up to the end of the previous week still uncorrected can be centralized and connections made wherever possible. Stations having goods which they cannot dispose of, and stations requiring goods which they have not received, are, by means of the facts being brought under the notice of a central staff, enabled to come into their own.

Unaddressed Goods Under Mark. — An important point in connection with the loss of goods is the regrettable practice of a portion of the trading community in sending goods about the country under mark, i.e. goods branded with distinctive marks, letters, &c., in lieu of addresses, which are given only in the consignment notes. Obviously, with the multitudinous consignments which are handled daily by the great companies, the absence of address labels is a source of weakness. So much is this the case that the practice has grown up for the railway companies to affix their own labels to unaddressed packages, so as to facilitate their transit. On no grounds whatever can it be said to be a legitimate burden for the carriers, and, with the possible exception of shipping goods, no valid reason has, to our knowledge, been urged in defence of the practice. The one reason most commonly urged is that the absence of address labels prevents the disclosure of one's business to one's competitors; but surely, if one's competitors are able men, they will be fully acquainted with all possible customers in the trade they seek to serve. It is understood that only by payment for a "full car load" are the traders in the United States permitted to dispatch goods without their being properly addressed. This exception is a perfectly reasonable one, as the wagon label under such circumstances can ensure the proper conveyance of the traffic. On 31st

March, 1913, regulations, agreed to by all the railway companies, were introduced with the object of abolishing the practice of sending goods per rail without address, and in the main the trading community has accepted these regulations in the best possible manner, and every desire has been shown to assist the railway companies.

Breakage, Chafing, and Other Damage.—Damage to goods whilst in the carrier's possession is a most prolific cause of claim, and the annoying feature of the matter is that a great deal of damage arises from the poor manner in which the goods are packed by the senders. It may be considered that a railway company is quite justified in refusing to accept such goods for conveyance, and traders, upon reflection, ought to see that as a matter of common honesty it is incumbent upon them to hand goods to the carriers in a condition fit to travel. The companies can, however, help themselves by seeing that proper attention is paid to such points as the careful stowage of goods on stages and in wagons, by the liberal use of straw to prevent chafing in transit, by sensible and careful handling and loading of the goods, and, last, but by no means least, taking steps to see that rough shunting is avoided.

When one comes to the question of damage by wet and fire, it is found that the companies whose loading permits of a general use of sheet supporters, i.e. a bar elevated above the centre of the wagon, from end to end, so as to render the sheet quite taut and without hollows, do not suffer under this head to any great extent. Companies whose traffic does not permit of a general introduction of sheet supporters can do a good deal by periodical examination of the sheets to ensure their being in a fit condition for use, and by taking up sharply all cases of hollow sheeting.

Partial losses and pilferages have much in common, and the police department should be kept well advised of losses under these heads.

CHAPTER XI

Cross-channel Traffic

The geographical position of Great Britain and Ireland renders conveyance by sea an integral part of the mode of exchange for a great deal of goods and live-stock traffic between consignors and consignees, not only with the British possessions abroad, the Continent, and more distant foreign lands, but also with Ireland and the smaller islands around these shores. Many of the principal railway companies of Great Britain are owners of, and work, steamboats between British ports on the one hand and Irish and Continental ports on the other, and these cross-channel steamer services form a very valuable adjunct to the rail services, and many advantages are to be derived from the existence of a through service—rail and sea—under a single controlling interest. For instance, it is more probable

that the "throughout" control will ensure a greater rapidity of service than can be expected from a divided interest—i.e. railway company and independent steamship company—as often the independent steamship line will be required to connect with two or more railway systems, and the interests of each rail system have to be studied, as well as the individual requirements of the steamship company itself, and conflicting interests of this character are liable to have an adverse effect, however slight in some cases it may be.

On the majority of routes the steamboats in use are combined passenger and cargo steamers, but the business of some routes is extensive enough to warrant the employment of separate cargo, as well as separate passenger services—such as the London Midland and Scottish Railway Company's service between Holyhead and Dublin, which has a minimum of two cargo boats daily in each direction.

Some of the problems associated with the transit of goods and live-stock by sea differ considerably from the problems we have already discussed in relation to land transit, and it is necessary to make a brief survey of them. It will assist the reader if we identify the terminal port as port A, to distinguish it from what we will call the intermediate port, which will be called port B.

Many of the remarks made in Chapter I apply with equal force to the reception of traffic at a port of shipment. All traffic received at port A must be carefully checked, labelled, &c. This having been accomplished, we reach the stage of loading the traffic into the steamers. One steamer accommodates as much traffic as would require a large number of wagons for a rail journey, and it is therefore necessary that a system of sorting and stowage be employed so as to facilitate the transit of different commodities to varying destinations.

Stowage of Goods.—In these days of speed, attention has to be concentrated upon carrying goods between two points in the shortest possible time. The persons engaged at the work of loading the vessels must therefore sort the goods and place them in the holds of the steamers in accordance with the requirements of the port of discharge, port B; goods which are to be dispatched by the first train after arrival of the vessel at port B must be stowed so that they will be the first to be discharged, those for the second train being stowed next, and so on. From this it will be seen that the holdsmen must possess a good knowledge of the train-loading arrangements, and, although it sounds very easy, the difficulties will be appreciated when we call to mind the fact that the traffic has to be sorted after arrival at the shipping port, port A, and that it continues to arrive up to sailing time, and that goods requiring to come out of the ship first, arrive during the whole time shipping is conducted. Sorting must be done concurrently with the shipping; to sort and retain goods on the platform results in congestion and delay.

Live-stock forms a considerable share of the cross-channel traffic, and requires great care and attention, so that no mixing of the various con-

signments will take place when the cattle, sheep, pigs, or horses are discharged. Properly numbered pens for the cattle, &c., and boxes, stalls, and pens for the horses, are necessary, and a sufficient number of qualified attendants must accompany the animals to ensure their safety and comfort on the sea journey. Rigid inspection of the animals is enforced at port A, before shipment, to guard against the spread of any disease, and to see that the beasts are properly treated.

The shipment of the cargo in the holds and the live-stock to the decks fitted to receive it can be conducted at the same time.

The large quantity of perishable traffic—butter, bacon, fish, dead meat, &c.—necessitates attention to the temperature of the holds, &c., and cold chambers, ventilating fans, and ice are required especially during the summer months. Racks for hanging dead meat may be provided.

Every opportunity must be taken to reduce the amount of handling, and to this end crates and skips are useful for the loading of traffic passing in quantities, so that goods for a certain station, or consignments for a particular trader, may travel through without intermediate handling.

Trays for motors, cradles for eggs, skips for parcels, &c., very materially assist in safe carriage, inasmuch as the pressure from the hoisting tackle is thus relieved.

Checking Goods at Port of Discharge.—The agent at the port of shipment (A) must constantly study his traffic, so that it can be expeditiously handled at the port of discharge, as well as at port of shipment, and to this end a summary of each shipload is telegraphed, and this enables the agent at port B across channel to prepare the necessary staff and rolling stock. In addition, manifests or loading lists are prepared and sent with the goods, showing what traffic is passing, and the points to which it is to be loaded when discharged from the vessel. Two extra copies of the invoice to large stations are sufficient for this purpose, but for small stations, lists bearing the name of the destination or point of transfer are necessary. These lists require to be in duplicate. The explanation of the second copy of invoice and loading list is found in the system of checking on the discharge of the goods.

Several wagons are in course of being loaded with goods for one destination at the same time, and two checkers (or more if necessary) can be allocated to the work of checking such traffic, each checker being supplied with one of the copies of the loading lists, and on the conclusion of loading the copies are compared and a check made to the invoices. Were the copies referred to not supplied it would be necessary to record all the goods as they are loaded into the wagons, and then make comparisons of the record with the invoices—a much more cumbersome and less efficient method. It will be gathered from the foregoing that the staff at port B have, on receipt of the documents, a complete statement —in the handiest form possible—of the traffic to be dealt with; this is an advantage in working not equalled at any ordinary goods station.

Checking "Outwards" Traffic.—We will now turn our attention

to the traffic passing in the reverse direction—port B to port A. This will be traffic originating at inland stations destined for port A or stations beyond. The transfer of the traffic from the wagons to the steamers is but an episode in the journey in comparison with the transfer of the traffic from the steamer to the wagons. In the latter case the goods are for numerous destinations; in the former the goods are—so far as the staff at port B are concerned—for one destination only, i.e. port A. In the interests of speedy transit the main principle to be laid down is speedy shipment, and to facilitate this, time and money need not be wasted in needless checking. Checking of traffic from other companies' lines is necessary to preserve Clearing House rights, but checking—other than "spot" checking—of "local" traffic, i.e. traffic originating on the steamship-owning company's line, is superfluous. Such checking can only result in delays in shipment, whilst it also, by holding up the invoices, reduces the amount of information available at port A both before and after arrival of the steamer. It is important that the loading staff at port B should pay special attention to stowage of the goods so that urgent traffic, such as fruit and other perishable goods, parcel post, &c., shall come out first on arrival of the steamer at port A.

Beyond referring to the fact that all discrepancies must be carefully noted at port B before shipment, and a record made—a copy of which should be supplied to port A—we do not think there is any need to occupy the reader's time further with the requirements of port B, as it will be more convenient and intelligible to confine ourselves to the necessities of the situation at port A on arrival of the steamer at that port.

Unloading Difficulties.—The outstanding feature at port A is that the staff engaged in unloading the goods from the steamer and loading them for delivery or forward transit is placed at a considerable disadvantage compared with receiving staffs at an inland goods station. At the latter the goods arrive in wagon loads, and the invoices accompanying them bear the wagon numbers, or if the goods arrive without invoices the wagon label shows where the goods came from. It is therefore a secondary matter whether the goods themselves show the point or sender from which they come, as in the absence of such information it is easily obtainable. With a steamer load of goods—representing anything from 50 to 100 or more wagons—it is quite different. A check to the invoices on the unloading of the goods is impossible, for the simple reasons that the checkers would have an unmanageable mass of documents to handle, and the discharging would be seriously impeded. Further, the invoices are required for the writing out of the delivery dockets at the same time as, or before, the discharging takes place.

Preparation of Delivery Documents.—Port A, if it is to deal expeditiously with the traffic it receives for delivery, &c., must be able to prepare its delivery documents well in advance of the goods, so that the loading checkers can deal properly with the traffic as it comes to them. If the invoices are retained at port B for checking purposes, it is

obvious that they must travel with the goods, and that on arrival at port A the work of writing the delivery documents can only proceed concurrently with the discharging of the goods from the vessel, and it is by no means easy under these circumstances to ensure that the dockets will be prepared in a corresponding rotation to the discharge of the goods. But if the invoices are not used for checking at port B there are two methods available. One is to send the invoices by a boat to port A in advance of the boat carrying the traffic, where such a service is available; the other to make out the delivery documents at port B whilst the cargoes are being loaded. Another method, and one which does not necessitate the sacrifice of the check at port B, is to have the delivery documents written out by clerks on the steamer during the passage. All methods, however, have one main object—the preparation of the delivery documents before arrival and discharge of the goods, and the reason for this is that the check of the goods at port A must be to the delivery dockets, and afterwards, in case of discrepancy, back to the invoices.

A further and important point arising from the non-detention of the invoices at port B is this: the invoices arrive at port A in advance of the goods—sometimes before they have reached port B—and the delivery department, which otherwise would be without information, is able to advance the work, and is also in a position to satisfy the traders as to the whereabouts of the traffic they are interested in. This latter point is further increased in value because port B supplies port A with the numbers of the wagons shipped, and the numbers of the wagons not shipped, should there be any such. The advantages of this system, not only to the company, but also to the traders, need no demonstration.

Importance of Labelling.—We have established, then, the need and the possibility of the invoices reaching port A in good time, but further trouble has to be met and provided for. As the goods come out of the ship there is nothing to connect them with the wagon in which they travelled on the other side of the water, and nothing, unless the address card bears it—and unfortunately this is very seldom—to show the point of origin. It is therefore necessary that the sending station labels each package, showing at least the name of the station, so that connections may be facilitated, and, in the absence of documents and address, communication with senders easily established. We want to emphasize here as strongly as possible that in the interests of the public themselves it is imperative that every article sent by rail for further transit by sea shall be fully and distinctly labelled. It is important that goods travelling by land only shall be properly labelled, but it is much more important when sea transit also is involved. We would go further, and urge as a precautionary measure that addresses should also be put inside the packages.

As the speed of loading and discharging vessels is regulated by the speed of the cranes used, it is very important to keep the cranes in proper working order, and necessary to provide the most efficient and up-to-date cranes obtainable.

The Train-Ferry System.—It has been recapitulated in this chapter what the intricacies are of checking, loading, and unloading traffic when a sea voyage intervenes, and we have also seen that whenever traffic has to break bulk, costs immediately increase considerably, and we cannot close without a brief reference to the recent innovation (recent at all events so far as this country is concerned) of the train-ferry service inaugurated between Harwich and Zeebrugge on 24th April, 1924.

The system is one whereby wagons are run on to, and off, a ferry-steamer, thus obviating transhipment. Most readers will be aware that train-ferry steamers were employed during the War for the transportation of material to the Continent, and although the system had previously been introduced for ferrying wagons across the Firth of Forth and also between the Mainland and the Isle of Wight, the Harwich-Zeebrugge service does really mark the inauguration in this country of train-ferry steamers for commercial work on a large scale.

It is difficult to foretell how far the experiment will be developed, but when it is stated that traffic loaded in London need not be handled again until unloaded at Brussels, it will be appreciated that the economic advantages of the system are sufficient to warrant its extension to other ports, where the circumstances permit.

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